

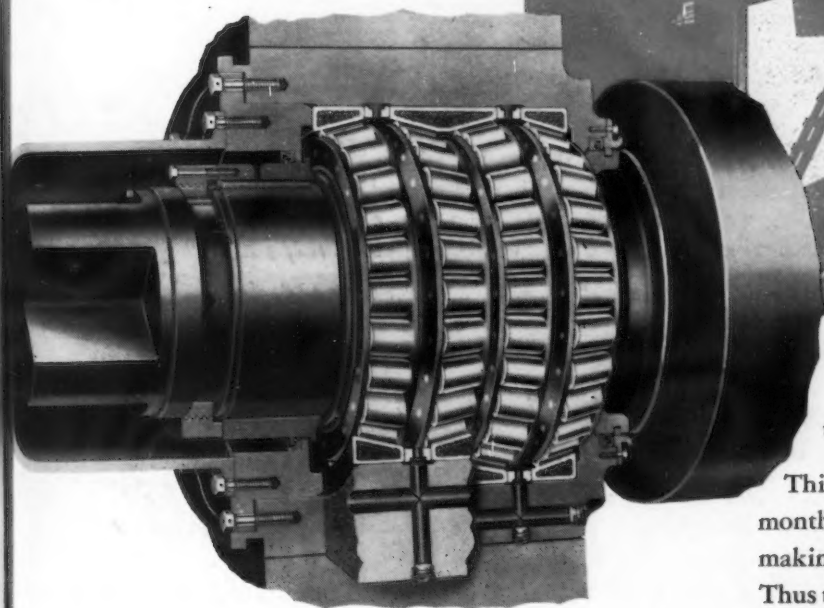
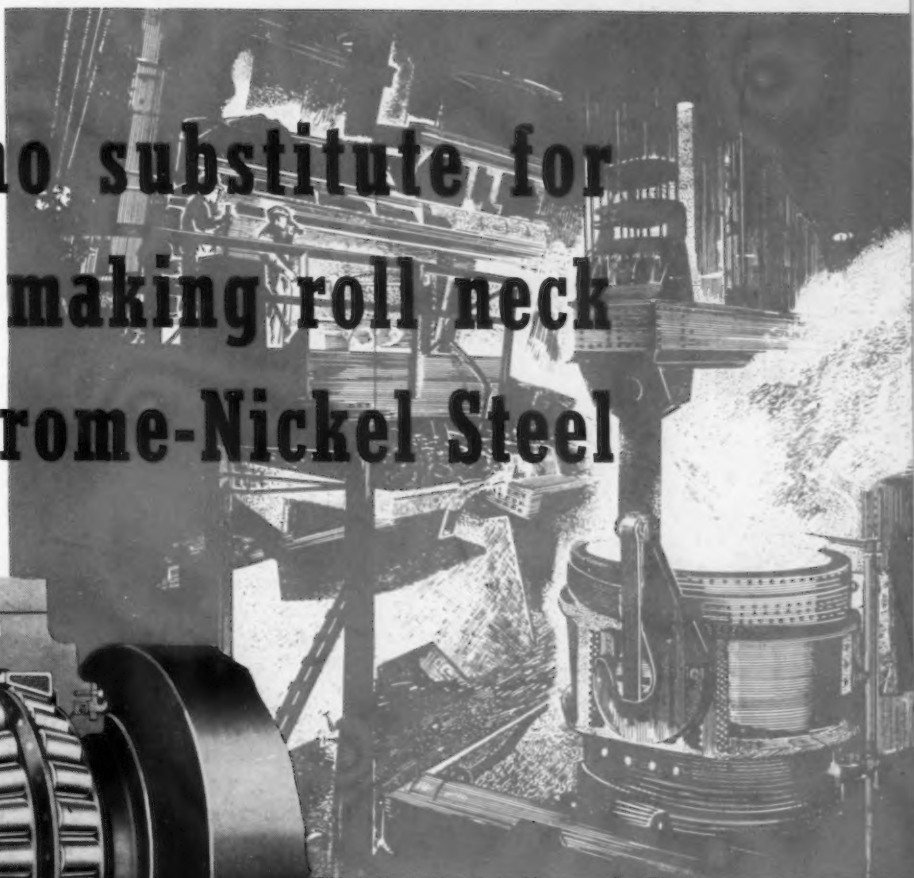
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IRON AGE

There's no substitute for experience in making roll neck bearings of Chrome-Nickel Steel



fabrication—melting, rolling, forging, heat treating, machining.

This knowledge cannot be gained in a few weeks or months; it requires years of actual experience in the making of the steel and the making of the bearings. Thus there can be no substitute for the combined experience of our metallurgists; steel makers; and bearing manufacturers. That is why Timken Roll Neck Bearings made of Chrome-Nickel Steel have an unapproached record of performance and endurance on many of the world's largest and most important rolling mills. The Timken Roller Bearing Company, Canton, Ohio.

Timken Roll Neck Bearings have been manufactured of S.A.E. E 3310 Steel (with higher nickel content) for many years, the steel being produced in our own steel plant.

We originally adopted this steel for roll neck bearings because, research and testing in our laboratories had proved it to be the best steel for this purpose.

However, in order to take full advantage of its desirable characteristics, it is necessary to know the steel intimately in every phase of its manufacture and

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



Keepp producing for victory
—but plan for peace



**IT IS PATRIOTIC TO PLAN NOW
FOR THE POSTWAR ERA**

Warner & Swasey offers you practical help on postwar planning. We have a corps of engineers who are skilled in all machine operations involved in production of precision parts made of metal. They are helping many war plants improve methods and machines for greater production. They will continue to do so, but their services are also available to management interested in planning now for the future. Write Warner & Swasey, Cleveland 3, Ohio.

WARNER & SWASEY field men have kept contact with hundreds of manufacturers throughout this war period. As production engineers they are offering their experience to help shops that converted to war and the hundreds of new plants that were built exclusively for war purposes.

In one large aircraft plant, they recommended changes in machining sequences that produced a volume on ten turret lathes equal to that of twenty turret lathes working under former method.

In a sub-contractor's plant they advised a different model machine than the ones being used for the same operation by the prime contractor; it resulted in greater production—and lower cost per piece.

In another war plant (one of the world's largest) a group of Warner & Swasey engineers worked for weeks, planning machines and layout for the entire metal turning department.

Many manufacturers, looking ahead, know transition from war to peacetime production must be accomplished quickly if they are to maintain employment. They realize that postwar competition will be keen—that only the most modern machines, techniques, and methods will keep them in front in the struggle for domestic and foreign markets.

Planning for postwar can be done now *without* impairing all-out production necessary to win the war. The war's end will bring new challenges—and American industry must be prepared to accept them.

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&
SWASEY**

Turret Lathes
Cleveland

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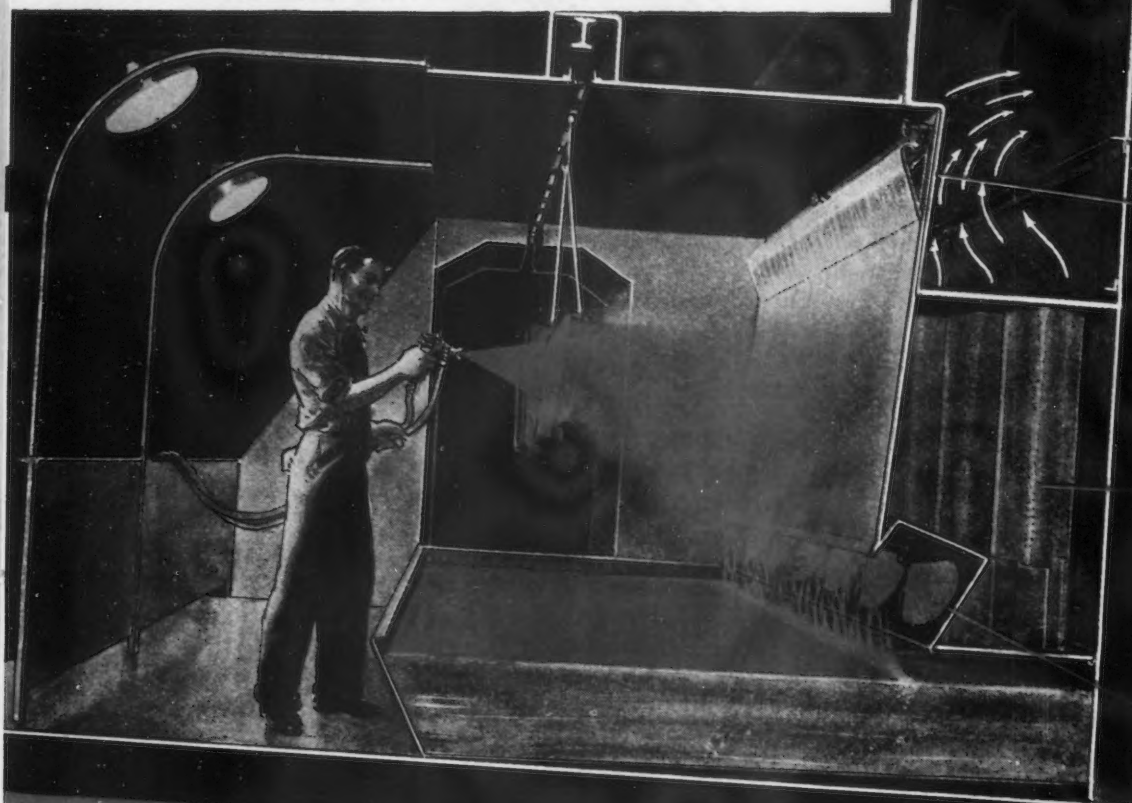
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the advantages of

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- Ventilation
- Visibility
- Accessibility



Visible Construction Features . . .

- 1 Adjustable reservoir construction of gutter above flood sheet insures an even flow of water over sheet, keeping entire surface clean.
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No matter how large or how small your plant or product may be, the Mahon Hydro-Filter Spray Booth can be adapted to your particular conditions. Mahon engineers design each installation precisely for each specific purpose. They will cooperate in the laying out of your entire spray painting production system.

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The IRON AGE

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Oct. 14, 1943

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More Muscle—Less Fat

THIS is the "Metal Congress Number" of The Iron Age. Some of you at first glance may not recognize it as such for it is not as "fat" as it customarily has been. We believe that it is the duty of publications as well as soldiers in war time to take off fat and put on muscle.

It was for this reason that we announced in our first issue of January of this year that for the duration of the war The Iron Age would publish no more "special numbers" in the advertising sense. That in view of the necessity of conserving paper, which is a critical material, we would neither solicit nor accept extra business for such issues, profitable as such may have been to us in the past.

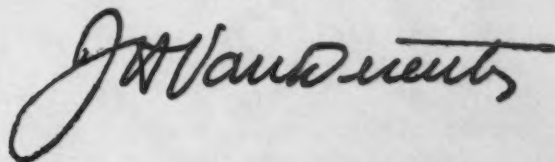
It may interest you to know, and we certainly want you to know, that The Iron Age has not only lived up to the paper restrictions imposed upon all publications by the War Production Board on Jan. 1 but has exceeded these required savings. And we believe we have done this without detracting in the least from our service either to readers or to advertisers.

We believe implicitly that service to readers of publications such as ours determines advertising value. Such service in war time lies in helping our readers to fulfill their obligations to their country and to the cause by increasing production and decreasing waste. The profit angle, which is important in peace time, is entirely secondary now. Both for you and for us.

Industrial publications serving the war industries and technical societies such as the American Society for Metals comprise the "intelligence section" of production. It is as important for producers to have the correct and latest information with which to plan their strategy as it is for our generals in staff and field. Thus, our first obligation is to keep our readers exceptionally well posted both as to the constantly occurring developments in techniques and in the equally constantly occurring changes in administrative regulations. This we have done to the best of our ability.

The second obligation is to use whatever material in the way of paper that remains in best serving our regular advertisers. This is the same principle followed by every manufacturer in connection with whatever material he may obtain over and above that required for war material production.

The several million pages of paper that we are saving by refusing to capitalize fully the earning power of this issue will be devoted to the needs of our regular customers—our readers and advertisers.



**INLAND SHEETS
AT WORK FOR
VICTORY**



Here 7-in. cylinders are turned inside out and reduced to 6 in. diameter.

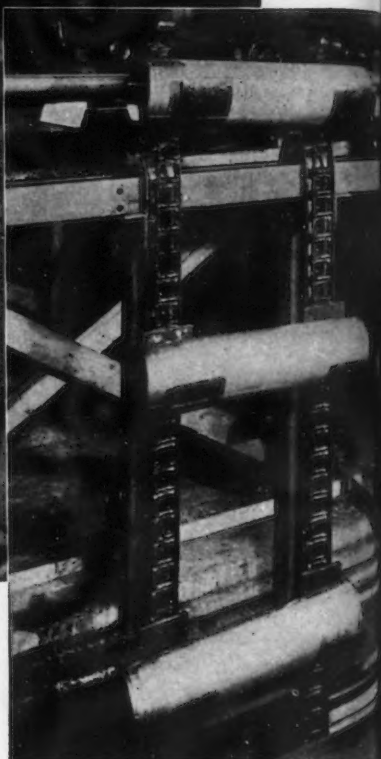
4½" x 17" Steel Cylinders— Drawn from Inland Sheets

Only four operations are necessary to form a 4½-in. diameter by 17 in. deep cylinder that is part of a shell container used by the U. S. Navy.

In the first operation an 18-in., 19-gage, blank, cut from Inland deep drawing sheets, is formed into a cylinder 10 in. in diameter by 6 in. deep. The second operation reduces the diameter to 7 in. and increases the depth to 8⅞ in. In the third operation a 7-in. by 8⅞-in. cylinder is placed bottom end up over the lower die. The upper die, pressing against

the bottom of the 7-in. cylinder, forces it into the lower die, turning the cylinder inside out while reducing the diameter to 6 in. and increasing the length to 12⅝ in. In the final operation a 6-in. cylinder is placed over the upper die which forces it through a ring die, drawing the cylinder to final size, 4½ in. in diameter by 17 in. deep.

These cylinder forming operations, like many other difficult war jobs, are proof of the uniformity and high quality of Inland flat rolled steel products—products that are being used 100% for Victory.



Cylinders, drawn to 4½-in. diameter in. deep through a ring die, are on from the press pit to the finishing



INLAND STEEL COMPANY

38 S. Dearborn St.

50th ANNIVERSARY

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● The military truck program, anticipating destruction of European railroads, calls for 7 to 10-ton capacity trucks in assemblies well into six figures. In 1941, last full civilian truck production year, only 14,458 trucks were produced in 5-ton and up capacities.

● Phosphate coating of steel prior to electroplating with silver has been found to result in great improvement in adhesion. Most of the phosphate coating disappears during the first stages of plating. The principle involved will likely be applicable to other metals.

● A recently worked out diagram method enables prediction of the dimensions of square bars, 1:2 flat bars, and the thickness of plates which will have a desired center hardness for a predetermined severity of quench. By the same method, metallurgists can predict the diameter of round bars having a desired hardness at any point.

● Aluminum, brass, copper, steel and plastics can all be hardness tested with the Barcol impressor, a quick lightweight shop instrument. Newly developed as a practical instrument, its principles were first published in 1857.

● Tests indicate refrigeration will bring tremendous production increases in aircraft spot welding. Up to 5000 welds can be made without dressing electrodes.

● And: Aircraft tests with negative angle milling show production rises as great as 450, 2000 and 3000 per cent.

● Critical figure for losses on a bombing mission for several years has been assumed to be 10 per cent. However, 10 per cent two years ago represented the discharge of about 15 tons of bombs for the loss of one machine and seven highly trained men from every ten aircraft sent out. But, today, a 10 per cent loss means for every one machine and its crew of seven lost, about 35 tons of bombs are dropped.

● But: Allied losses on the German bombing run are mounting considerably, and are far more severe than the average civilian realizes. These losses are leading the Germans to conclude that the Allied air offensive must slacken, basing the opinion on their own experience over Britain. But they make the mistake of ignoring the great Allied aircraft production and enormous crew training program.

● The German bombing run is shattering on crew nerves. English crews make 30 Continental bombing tours, then take a 6-month rest, then 20 more tours, then those surviving are permanently removed from combat.

● U.S. aviators make 25 tours, then those surviving are returned to the U.S., their air fighting over.

● A few Englishmen have asked to be kept on and have completed as many as 200 bombing tours. Some captured Germans have made as high as 300.

● The Germans are throwing everything into the defense of the homeland. Bombers run into as high as 500 fighters, which maintain their attack over a distance of several hundred miles, land to re-arm and re-fuel and resume their attacks on the returning bombers.

● Luftflotten on the Russian front have been stripped to strengthen homeland defense. All types of planes are thrown in, the commonest mixture being Focke-Wulf Fw 190s and Messerschmitt Me 109s, but Ju 88s, Me 110s and Me 210s are often seen in the company of the single-seaters. Dornier 217s, medium bombers, have even been used as night fighters.

● Germany is frantically searching for an answer to night bombing. Slow-falling flares were used to light up the attackers. Relative failure of this led them to revert to an intense anti-aircraft barrage. Then the failure of this led to trying the flares again.

● Apparently Germany has no highly developed facilities for radiolocation (radar) or television as an aid to defense. Some time ago Siemens, Lorenz, Telefunken, Albert Patin and other radio and electrical concerns advertised persistently for technicians skilled in these trades, but the resort to flares suggests that the progress made has not been enough. An efficient radiolocation set or similar apparatus would allow a fighter to attack in the dark.



War and

WITH less fanfare and glamour but considerably more preparation from the standpoint of a study of technical developments and technological changes in the metal-working industries during the past year, the 25th National Metal Congress and Exposition will get under way in Chicago on Oct. 18 for a five-day conference. The activities of metal manufacturers in the war program, in order with the times, will be covered by the technical organizations participating in the Metal Congress, with meetings geared directly to the war production effort and to post-war planning. These organizations which are cooperating with the American Society for Metals in the Metal Congress—the American Institute of Mining and Metallurgical Engineers, the American Welding Society, and the Wire Association—have scheduled speakers who can and will

aid in disseminating information of value to manufacturers in what are hoped to be the closing months of the war.

One of the highlights of the Chicago Metal Congress will be the American Society for Metals series of 17 practical sessions on war production, conservation, and post-war planning in the metal-working fields. These meetings will be conducted by about 200 men outstanding for their work in the various phases covered by the meetings. The clinics will deal with the pressing problems of war production and conservation today and the place metal will fill in the peace-time economy of tomorrow. Such groups are expected to provide a central clearing house for the practical solution of such problems.

These meetings will all be held in the afternoon and evening sessions conducted by A.S.M. Each is a planned affair, and discussions will be kept in purely technical and educational channels. The meetings will include discussions on the following subjects: Advanced metal quenching practices including armor and armor piercing shot; sampling and analysis of Boron steels; non-destructive inspection tests, including appraisal of surface finishes and X-ray and Magnaflux inspection and interpretation; purchase of steel on the basis of expected performance; special alloy additives in steel production; foundry metallurgy; and powdered metallurgy. Also, steelmaking methods will come up for examination, and there will be meetings on metal surface hardening.

An innovation in this year's Metal Show is the A.S.M. "Victory Hour." Each day of the convention, except Wednesday, at 11:30 A. M., the A.S.M. will conduct a 30-min. meeting to be addressed by leaders in business and labor and by representatives of the Army and Navy. A meeting will be devoted to each of these phases, with the thought being to bring attendants closer to a realization of the problems and performances of management, labor, and the Armed Services.

About 36 technical papers will be presented at the A.S.M. technical meetings at the Palmer House in the morning meetings. There will be three meetings conducted simultaneously each morning except Wednesday with three papers read at each meeting. Heavier emphasis was placed this year on research, as witnessed by the proportionately greater number of papers that will be presented by representatives of private and university research organizations and by technologists from government arsenals.

The Iron and Steel and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers will, as usual, hold their fall meeting in connection with the National Metal Congress and Exposition. This meeting begins Oct. 16, lasting through Oct. 20, with meetings scheduled for each of these days and a field trip through some Illinois coal mining operations on Sunday, Oct. 17. Refractory problems of the production man will be covered from both ferrous and non-ferrous metal standpoints, and there are two papers scheduled on the theory of deep drawing. From the

M. A. GROSSMAN, director of research for Carnegie-Illinois Steel Corp., Chicago. President-elect of American Society for Metals.



H. J. FRENCH, has charge of Alloy Steel and Iron Development, International Nickel Co. President of the American Society for Metals.



Post-War-- Metal Show Theme

iron and steel producers' angle, a description and the economics of the two new western steel plants will hold a great deal of interest. These meetings, on Tuesday, will delve deeply into management's considerations of the Kaiser Plant at Fontana, Calif., and the Columbia Steel Co. plant at Geneva, Utah.

Among the other technical meetings that will be conducted by the A.I.M.E. will be meetings on physical metallurgy and the electron microscope; symposiums on deep drawing; on the practical aspects of diffusion; on cohesive strength, and on copper and copper-rich alloys. Also, three or four papers on hardenability and jominy tests as well as a symposium on segregation in steel will be interesting to plant metallurgical staffs.

The American Welding Society will present nearly 60 technical papers at simultaneous sessions every morning and afternoon during the week of the Metal Show. These topics are of major importance and will include sessions on: cutting, railroad welding, metal weldability, education, resistance welding, welded tubing, flame hardening

... With initial war production problems out of the way and production techniques and controls well established, the 25th National Metal Congress and Exposition will attempt to give industry a peep around the corner of tomorrow into the post-war manufacturing world.

and hard facing, ship welding, research in welding, aircraft, non-ferrous welding and brazing, piping and distribution systems, inspection and training, repair and maintenance, production, and welding of pressure vessels. Developments in welding during the past year have been numerous because of the emphasis for speed in construction and fabrication brought on by the war. Many of these new developments and techniques will come up for discussion at the meetings of the American Welding Society.

Welded construction in railroad applications will be covered by four papers, while investigations on the weldability of various types of steel and the evaluation of weldability will be covered by five papers to be read by technologists from various university laboratories, the Naval Research Laboratory, and Battelle Memorial Institute. The interest in ship welding is high, and six papers at two sessions on ship welding cover planning, pre-fabrication, control, and welding techniques in welded ship construction.

Likewise, welding in aircraft construction is important at present because of the demands of the armed services for greater aircraft production. Eleven papers covering welding of steel and non-ferrous metals used in aircraft construction will be presented. In the session on welding inspection, qualification, and training a symposium of applicable methods of inspection for arc welding will cover shipbuilding, structural welding, welding of pressure vessels and piping, aircraft, and machinery. Training welding operators will also be discussed at these meetings.

The Wire Association will feature the Mordica Memorial Lecture which will be delivered this year by Flint C. Elder, special research engineer of American Steel & Wire Co. The topic of Mr. Elder's lecture will be "The Wire Drawing Die."

With growing shortages of base

metals, every industry has had to turn to the use of substitutes. A paper on the use of lead base coatings as a substitute for zinc in wire galvanizing will be discussed at a technical meeting of the Wire Association. Other technical papers of the Wire Association will deal with hydrogen embrittlement in spring steels, glass wire insulations, the applications of synthetic compounds to wire by extrusion, electrical paper insulations, and other phases of commercial and electrical applications of wire.

The displays of the National Metal Congress and Exposition will be somewhat restricted to the showing of lighter equipment, since the display rooms will be located on the seventh, eighth, and ninth floors of the Palmer House. About 175 manufacturers have reserved space to exhibit their equipment.

DR. C. H. MATHEWSON, Professor of Metallurgy, Yale University. He will deliver this year's Edward de Mille Campbell Memorial Lecture.



DR. KENT R. VAN HORN, research metallurgist of Aluminum Co. of America, Cleveland. Vice president-elect of the American Society for Metals.





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Correlated Technical Program

Monday, Oct. 18

9:00 A.M.

Quenching and Hardenability of Hollow Cylinders, by J. H. Hollomon and C. Zener, Watertown Arsenal, A.S.M., Palmer House.

An X-ray Study of Brasses Formed by the Interdiffusion of Copper and Zinc Deposited on Glass by Vaporization, by A. A. Burr, Armstrong Cork Co.; H. S. Coleman, H. L. Yeagley, and W. P. Davey, Pennsylvania State College, A.S.M., Palmer House.

The Microhardness Tester as a Metallurgical Tool, by Constance B. Brodie, General Electric Co., A.S.M., Palmer House.

Regional Meeting on Refractory Problems from the Production Man's Standpoint—*Refractory Problems in Ferrous Metal Production*, A.I.M.E., Hotel Sherman.

Theory of Deep Drawing, two papers arranged by Karl Fethers, A.I.M.E. Iron and Steel Division, Hotel Sherman.

Physical Metallurgy and Electron Microscope, A.I.M.E., Institute of Metals Division, Hotel Sherman.

9:30 A.M.

Presentation of Medals and Prizes; *The Adams Lecture*, A.W.S., Hotel Morrison.

9:45 A.M.

Rates of Cooling in Blocks and Cylinders, by C. B. Post and W. H. Fenstermacher, Carpenter Steel Co., A.S.M., Palmer House.

Dimensional Changes Encountered in Tube Sinking, by W. M. Baldwin, Jr., and T. S. Howald, Chase Brass & Copper Co., A.S.M., Palmer House.

Intercrystalline Cohesion of Metals, by E. R. Parker, General Electric Co., A.S.M., Palmer House.

Regional Meeting on Refractory Problems from the Production Man's Standpoint—*Refractory Problems in Non-Ferrous Metal Production*, A.I.M.E., Hotel Sherman.

10:30 A.M.

An Evaluation of Quenching Oils, by E. K. Spring, P. T. Lansdale, and C. W. Alexander, Henry Disston & Sons, Inc., A.S.M., Palmer House.

A Metallographic Study of the Decomposition of Austenite in Manganese Steels, by John V. Russell, Republic Steel Corp., and Francis T. McGuire, University of Kentucky, A.S.M., Palmer House.

Plastic Flow and Rupture of Metals, by C. Zener and J. H. Hollomon, Watertown Arsenal, A.S.M., Palmer House.

Regional Meeting on Refractory Problems from the Production Man's Standpoint—*Meeting the Difficulties*, A.I.M.E., Hotel Sherman.

Directors' Meeting of Wire Association, LaSalle Hotel.

11:30 A.M.

A.S.M. Victory Hour. Talk by a representative of labor.

12:00 Noon

Joint Luncheon of A.I.M.E., Hotel Sherman.

12:30 P.M.

Directors' Luncheon—Program Committee and Speakers, W.A., LaSalle Hotel.

2:00 P.M.

War Production, Conservation, and Post War Planning Meetings, A.S.M., Palmer House.

1. *Advanced Quenching Practices*, including discussion on armor and armor piercing shot.

2. *Sampling and Analysis of Boron Steels*.

Description and Economics of Kaiser Steel Plant at Fontana, Cal., A.I.M.E. Regional and Iron and Steel Division, Hotel Sherman.

Symposium on Deep Drawing, A.I.M.E. Iron and Steel Division, Hotel Sherman.

Symposium on Practical Aspects of Diffusion, arranged by E. A. Anderson, A.I.M.E. Institute of Metals Division, Hotel Sherman.

Flame Cutting Heavy Sections and Large Diameters, by R. L. Dely and E. Benyo, Bethlehem Steel Co., A.W.S. Session on Cutting, Hotel Morrison.

The Welded Locomotive Boiler, by E. G. Young, University of Illinois, A.W.S. Railroad Session, Hotel Morrison.

Investigations at Lehigh, by Gilbert E. Doan, Lehigh University, A.W.S. Weldability Session, Hotel Morrison.

2:30 P.M.

Designing Mills for Government Purposes, by Paul M. Mueller, Revere Copper and Brass Co., W.A., LaSalle Hotel.

2:45 P.M.

Welding and Cutting in Steel Mills, by T. W. Morgan, American Rolling Mill Co., A.W.S. Session on Cutting, Hotel Morrison.

Welding as it Applies to Railroad, by Robert Moran, Missouri Pacific Railroad, A.W.S. Railroad Session, Hotel Morrison.

Investigations of Rensselaer Polytechnic Institute, by Wendell F. Hess, Rensselaer Polytechnic Institute, A.W.S. Weldability Session, Hotel Morrison.

3:00 P.M.

Description and Economics of Columbia Steel Co. Plant at Geneva, Utah, A.I.M.E. Regional and Iron and Steel Division, Hotel Sherman.

Weldability of Silicon Steels, by C. E. Jackson and G. G. Luther, Naval Research Laboratory, A.W.S. Weldability Session, Hotel Morrison.

3:30 P.M.

Electronic Control of Gas-Cutting Machines, by R. D. McComb, General Electric Co., A.W.S. Session on Cutting, Hotel Morrison.

Railroad Shop Welding and Cutting, by J. W. Kenefic, Air Reduction Sales Co., A.W.S. Railroad Session, Hotel Morrison.

Weld Bead Hardness Tests on Plain Carbon, Nickel, and Nickel-Chromium Steels, by Oscar E. Harder and C. B. Voldrich, Battelle Memorial Institute, A.W.S. Weldability Session, Hotel Morrison.

Training in Work Simplification, by A. H. Mogensen, Factory, W.A., LaSalle Hotel.

4:00 P.M.

General Meeting of Board of Directors, A.I.M.E., Hotel Sherman.

4:15 P.M.

Machine Cutting for Assembly Line Fabrication, by C. O. Adams, Delco Products Division, General Motors Corp., (CONTINUED ON PAGE 166A)

MOLD preparation in the
foundry of Hendy Machine Co., Torrington, Conn.

Photo by Ritchie





HARDENING a gear with a Fellows flame hardener at the plant of Hendy Machine Co., Torrington, Conn.

Photo by Ritchie

Exhibitors at the Metal Congress

(All Exhibits on 7th, 8th and 9th Floors of Palmer House)

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- Acme Tool Co., New York. Room 802.
- Agfa Ansco Corp., Binghamton, N. Y. Room 714.
- Ajax Electric Co., Inc., Philadelphia. Room 801.
- Alien Property Custodian, Chicago. Room 724.
- Alloy Casting Co., Champaign, Ill. Room 787.
- Alox Corp., Niagara Falls, N. Y. Room 742.
- Aluminum Co. of America, Pittsburgh. Rooms 705 and 731.
- American Allsafe Co., Buffalo. Room 814.
- American Brass Co., Waterbury, Conn. Rooms 836 and 838.
- American Car & Foundry Co., New York. Room 859.
- American Chain & Cable Co., Bridgeport, Conn. Room 729.
- American Gas Furnace Co., Elizabeth, N. J. Room 882.
- American Machine & Metals, East Moline, Ill. Room 848.
- American Machinist, New York. Room 785.
- American Magnesium Corp., Cleveland. Rooms 705 and 731.
- American Society for Metals, Cleveland. Rooms 942W and 944W.
- American Transportation Co., Chicago. Room 712.
- Ampco Metal, Inc., Milwaukee. Room 846W.
- F. E. Anderson Oil Co., Portland, Conn. Room 749.
- Andresen, Inc., Pittsburgh. Room 967W.
- Atlas Publishing Co., New York. Room 965W.
- Automotive & Aviation Industries, Philadelphia. Room 977W.
- Baldwin Southwark Div., Philadelphia. Room 828.
- Barrett-Cravens Co., Chicago. Room 803.
- Bastian Blessing Co., Chicago. Room 830.
- Bausch & Lomb Optical Co., Rochester, N. Y. Room 706.
- Berco Mfg. Co., Chicago. Room 903.
- Brickseal Refractory Co., Hoboken, N. J. Room 942.
- Brush Development Co., Cleveland. Room 843.
- A. I. Buehler, Chicago. Room 905W.
- Bell & Gossett, Chicago. Room 788.
- Blue Book, Chicago. Room 878.
- By-Products Co., Coatesville, Pa. Room 732.
- Andrew C. Campbell Div., Bridgeport, Conn. Room 729.
- Canadian Radium & Uranium Corp., New York. Room 717.
- Central Scientific Co., Chicago. Room 775.
- Chicago Flexible Shaft Co., Chicago. Room 761.
- Chicago Steel Foundry Co., Chicago. Room 727.
- Cities Service Oil Co., New York. Room 807.
- Coffing Hoist Co., Danville, Ill. Room 943.
- Commerce Pattern Foundry & Machine Co., Detroit. Room 912.
- Conco Engineering Works, Mendota, Ill. Room 708.
- H. D. Conkey Co., Mendota, Ill. Room 708.
- Continental Industrial Engineers, Chicago. Room 905.
- Crown Rheostat & Supply Co., Chicago. Room 806.
- Continental Machines, Inc., Minneapolis. Rooms 833 and 834.
- The Chilton Co., Philadelphia. Room 825.
- Daily Metal Reporter, New York. Room 965W.
- Deepfreeze Div., North Chicago, Ill. Room 782.
- A. P. De Sanno & Son, Inc., Phoenixville, Pa. Room 777.
- W. C. Dillon & Co., Inc., Chicago. Room 809.
- Diversey Corp., Chicago. Room 818.
- Dravo Corp., Pittsburgh. Room 960.
- The Drever Co., Philadelphia. Room 760.
- Du Bois Plastic Products, Inc., Buffalo. Room 814.
- Allen B. DuMont Labs., Inc., Passaic, N. J. Rooms 841 and 842.
- Do-All Midwest Co., Chicago. Rooms 833 and 834.
- H. W. Dietert Co., Detroit. Room 879.
- Eastman Kodak Co., Rochester, N. Y. Room 849.
- Engis Equipment Co., Chicago. Room 979W.
- Erickson Steel Co., Cleveland. Room 830.
- Eutectic Welding Alloys, Inc., New York. Room 711.
- Federal Telephone & Radio Corp., Newark, N. J. Room 735.
- Federal Products Corp., Providence, R. I. Room 815.
- Federal Refractories Corp., Akron, Ohio. Room 855.
- Firth Sterling Steel Co., McKeesport, Pa. Rooms 831 and 832.
- Gaertner Scientific Corp., Chicago. Room 916.
- General Alloys Co., South Boston, Mass. Rooms 701 and 702.
- General Electric X-Ray Corp., Chicago. Room 728.
- Girdler Corp., Louisville, Ky. Room 733.
- Globe Machine & Stamping Co., Cleveland. Room 719.
- Claud S. Gordon Co., Chicago. Room 703.
- Gray-Mills Co., Chicago. Rooms 863-W and 980W.
- H & H Research Co., Detroit. Room 802.
- Handy & Harman, New York. Room 744.
- Harnischfeger Corp., Milwaukee. Room 813.
- H. M. Harper Co., Chicago. Room 887.
- Heat Treating & Forging, Pittsburgh. Room 969W.
- Hevi-Duty Electric Co., Milwaukee. Room 759.
- Hild Floor Machine Co., Chicago. Room 958.
- Hitchcock Publishing Co., Chicago. Room 878.
- A. F. Holden Co., New Haven, Conn. Room 762.
- W. J. Holliday & Co., Hammond, Ind. Room 959.
- E. F. Houghton & Co., Philadelphia. Room 901W.
- Illinois Testing Labs., Inc., Chicago. Room 757.
- Independent Pneumatic Tool Co., Chicago. Room 726.
- Indium Corp. of America, New York. Room 835.
- Induction Heating Corp., New York. Room 860.

(Continued on Page 170)

How to Estimate



By JOHN L. LAMONT

Research Metallurgist,
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DUE to the demand for accurately controlled properties and for economy in the use of alloy steels, much progress has been made toward prediction of response to hardening. The accompanying diagrams are presented as one method of making such prediction possible from the results of Jominy end quench hardenability tests.¹

The diagrams are similar to that given by Asimow, Craig, and Grossmann² for the relation of Jominy depth (distance from the quenched end) and ideal critical diameter (that size of bar that will contain 50 per cent martensite at the center when hardened with an ideal or infinitely fast quench). These relations have been extended in the accompanying diagrams by the use of Russell's³ constants for the cooling of round bars to include different rates of cooling, graduated positions from center to surface, and in addition, the conversion from round bars to squares, flats,

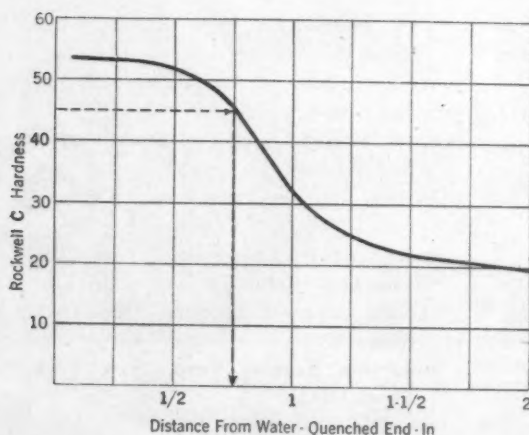
and plates. With these charts, if the severity of quench is known, it is possible to estimate directly from Jominy test data the hardness to be expected at various positions in round bars and at the center of square bars, 1:2 flat bars, and plates. If, in addition to Jominy hardenability data, the cross-sectional hardness has been determined on a quenched bar of the same steel, the severity with which the bar was quenched may be estimated.

Round Bars

The degree of hardening that is attained during quenching at a given point in a bar is dependent not only on the inherent hardenability characteristics of the steel and the severity of the quench, but also on the actual cooling rate resulting from the severity of quench, bar size, bar shape, and position within the bar. For purposes of mathematical treatment, the severity of quench is evaluated by the ability of the quenching medium to

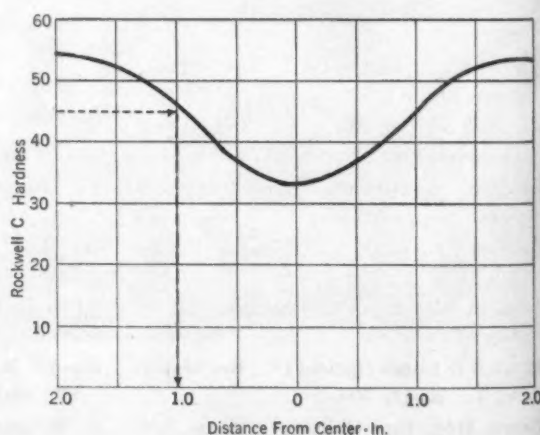
lower the surface temperature of the bar. It is assumed that the temperature gradient within the bar is controlled by the surface temperature. Thus the greatest conceivable severity of quench is when the surface is cooled instantaneously to the temperature of the quenching medium. Lesser severity of quench and larger sections lead to less rapid reduction of surface temperature and less steep temperature gradients between surface and center.

These relations have been calculated by Russell³ so that it is possible to estimate the time required for any position in a round bar, square, flat, or plate to be cooled to a given temperature during quenching. The exact temperature intermediate between that of the quench and the quenching medium that is critical in the hardening of steel is not known accurately, but Asimow, Craig, and Grossmann² have determined the time required for positions along a Jominy



LEFT
FIG. 1 — Jominy hardenability of a steel sample.

RIGHT
FIG. 2 — Cross-sectional hardness of a steel sample.



Hardening Depth in Bars

specimen to cool to half of the temperature difference between the quenching temperature of the bar and the temperature of the quenching medium. For convenience, therefore, the "half-temperature" time has been used in constructing the accompanying charts from Russell's constants using a thermal diffusivity coefficient of 0.009 sq. in. per sec. The severity of quench is expressed in the "H" value used by Grossmann, Asimow, and Urban⁴ instead of Russell's "h", but it may be noted that "h" = 2 "H". The depth of hardening, which may be measured in terms of microstructure, or more conveniently as hardness, is expressed as the ratio of the radius (r) of unhardened core to the radius (R) of the bar. Thus the fractional distance is $\frac{r}{R}$ and is zero at the center and 1.0 at the surface of the bar.

The severity of quench is influenced markedly by rate of agitation, composition, viscosity, etc., of the quenching medium as well as by such things as scale on the surface. In order, therefore, to apply the data

... The diagrams of this article enable one to predict from the results of a Jominy end quench hardenability test: (1) The severity of quench—if, in addition to the Jominy test data, the cross-sectional hardness distribution is known of a single bar of the same steel quenched under the desired quenching conditions; (2) the diameter of round bars having a desired hardness at any point between the center and surface for a predetermined severity of quench; (3) the cross-sectional hardness distribution in a round bar of a given size for a predetermined severity of quench; (4) the dimension of square bars, 1:2 flat bars and the thickness of plates having a desired hardness at the center for a predetermined severity of quench; and (5) the hardness at the center of square bars, 1:2 flat bars and plate for a predetermined severity of quench.

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derived from the Jominy test bar to actual quenching conditions, the severity of quench for a given quenching condition should be determined. The great differences in quenching severities that can be obtained with the same medium are shown by Grossmann and Asimow.⁵ See Table I.

Severity of quench may be established by direct measurement of cooling rate, but it is more convenient to measure it as a function of the depth to which a bar of steel hardens. This may be accomplished by hardening bars of different sizes as shown by Grossmann, Asimow, and Urban⁴ and

by other published methods such as that of Post, Greene, and Fenstermacher,⁶ that of Queneau and Mayo,⁷ or that of Boegehold.⁸ The method outlined here is based on the hardness data of the steel obtained from the Jominy hardenability test, and from cross-sectional hardness data of one bar hardened partially at the center.

In order to establish a relation between cooling rate (severity of quench, bar size, bar shape, and position in the bar) and hardenability, it is necessary to assume that a given cooling rate when applied to the same steel will produce the same hardness

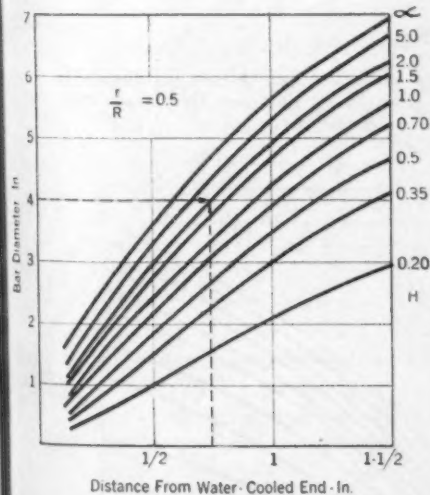


FIG. 3—Hardening of end quenched Jominy hardenability bar specimen for a fractional distance, corresponding to 50 per cent from the center.

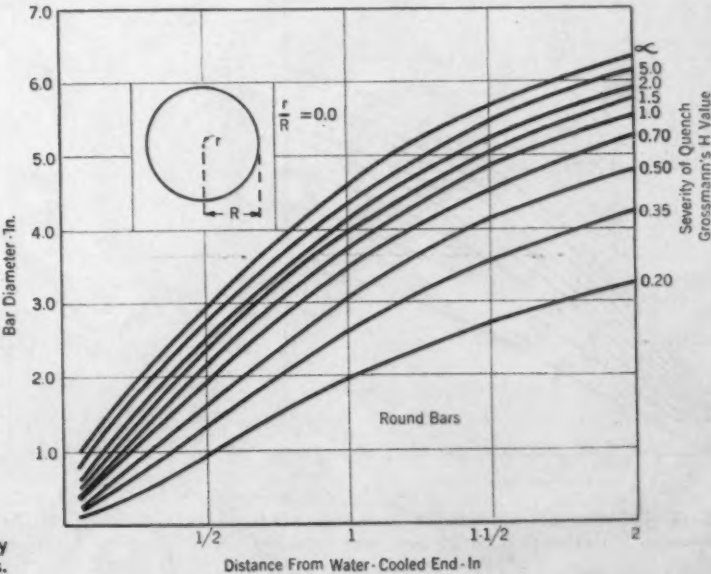


FIG. 4—Location on end quenched Jominy hardenability specimen corresponding to the center of round bars.

regardless of bar size, position in the bar, or the quenching medium used. That is, a specific "half-temperature" time will always produce the same hardness in the same steel at the position in the bar at which that "half-temperature" time is attained.

With this assumption, Figs. 4 to 14 can be used for the estimation of severity of quench from Jominy hardenability data and from a survey of the cross sectional hardness of a quenched bar of the same steel. For example, assume that a steel has a Jominy hardenability similar to that illustrated in Fig. 1 and has the cross-sectional hardness shown in Fig. 2 after quenching a 4 in. in diameter round bar. Then, selecting some convenient hardness, say 45 Rockwell C, it will be seen from Figs. 1 and 2 that 45 Rockwell C occurs at a depth of $\frac{3}{4}$ in. from the water cooled end

TABLE I

Condition of Medium	Severity of Quench ("H") with Indicated Medium			
	Air	Oil	Water	Brine
Still.....	0.02	0.3	1.0	2.2
Moderate motion in still medium.....		0.4-0.6	1.5-3.0	
Strong or violent motion in still medium.....		0.6-0.8	3.0-6.0	7.5
Strong current of medium or spray.....		1.0-1.7	6.0-12.0	

The fastest possible quench in which the surface temperature of the quenched bar is instantly lowered to that of the quenching medium has been designated as an ideal quench. The severity of an ideal quench is expressed as "H" = ∞ .

of the Jominy bar and also occurs at a distance of 1 in. from the center of the 4 in. in diameter bar or at a fractional distance of 0.5; that is, $r/R = \frac{1}{2} = 0.5$.

In Fig. 3, a diagram which shows hardening for a fractional distance of

$\frac{r}{R} = 0.5$ (also shown in Fig. 9), the R point at which the line indicative of $\frac{3}{4}$ in. on the Jominy bar intersects the line representative of a 4 in. in diameter bar indicates a quenching severity of H = 2.0.

Once the H value for severity of quench has been established on one steel for a given quenching condition, this H value remains the same as long as the quenching conditions remain constant. It is, therefore, possible to use this H value in order to estimate the depth of hardening of another section or another steel provided the quenching conditions are unchanged.

It should be noted that selection of the size of bar on which to determine cross-sectional hardness for establishing severity of quench values can be estimated roughly by reference to

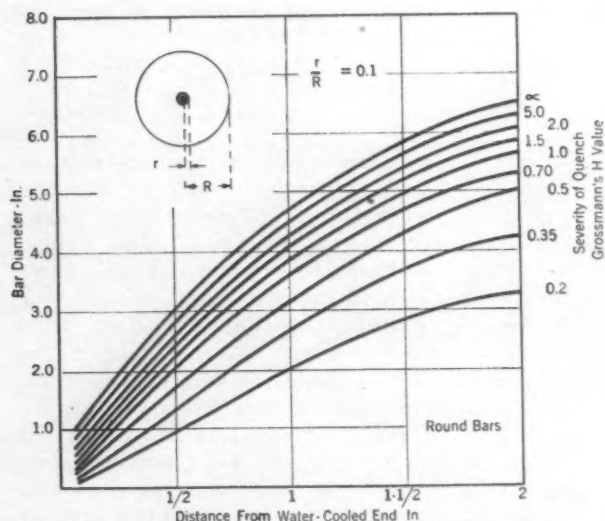


FIG. 5—Location on end quenched Jominy hardenability specimen corresponding to 10 per cent from the center of round bars.

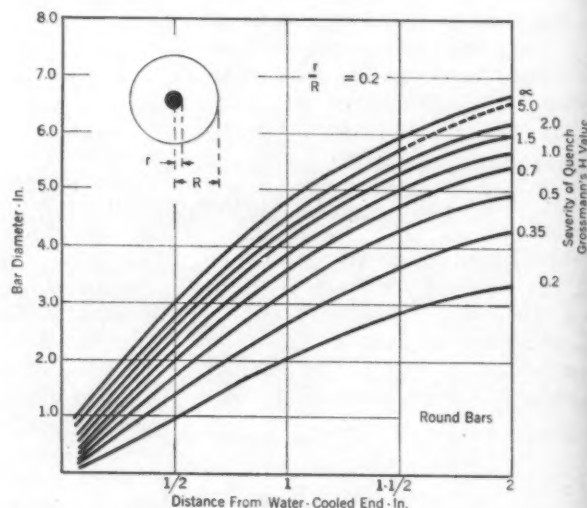


FIG. 6—Location on end quenched Jominy hardenability specimen corresponding to 20 per cent from the center of round bars.

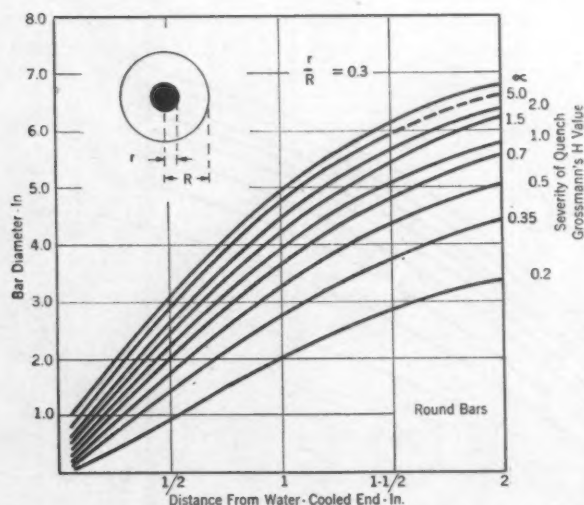


FIG. 7—Location on end quenched Jominy hardenability specimen corresponding to 30 per cent from the center of round bars.

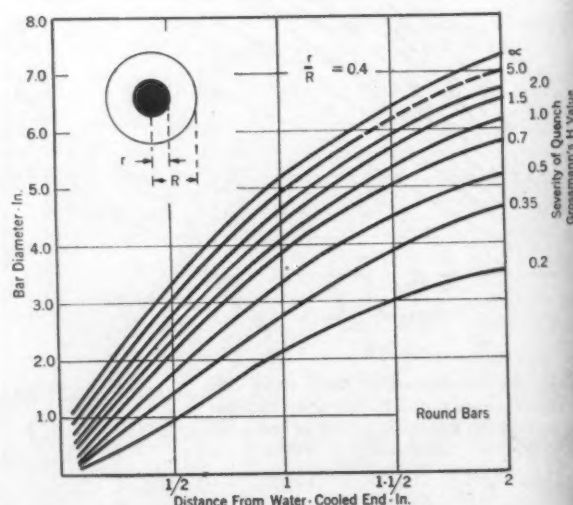


FIG. 8—Location on end quenched Jominy hardenability specimen corresponding to 40 per cent from the center of round bars.

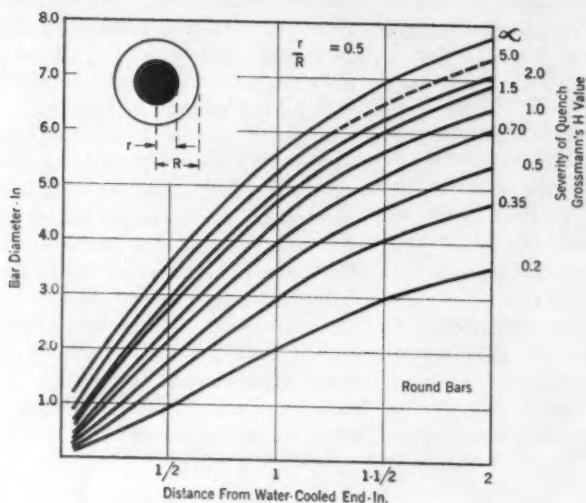


FIG. 9—Location on end quenched Jominy hardenability specimen corresponding to 50 per cent from the center of round bars.

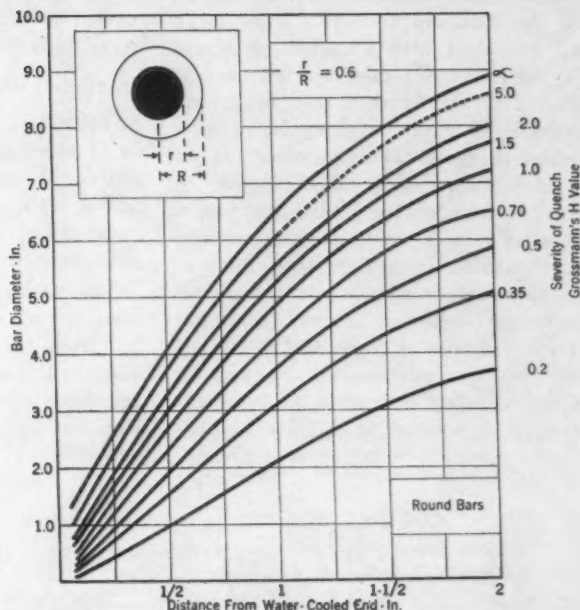


FIG. 10—Location on end quenched Jominy hardenability specimen corresponding to 60 per cent from the center of round bars.

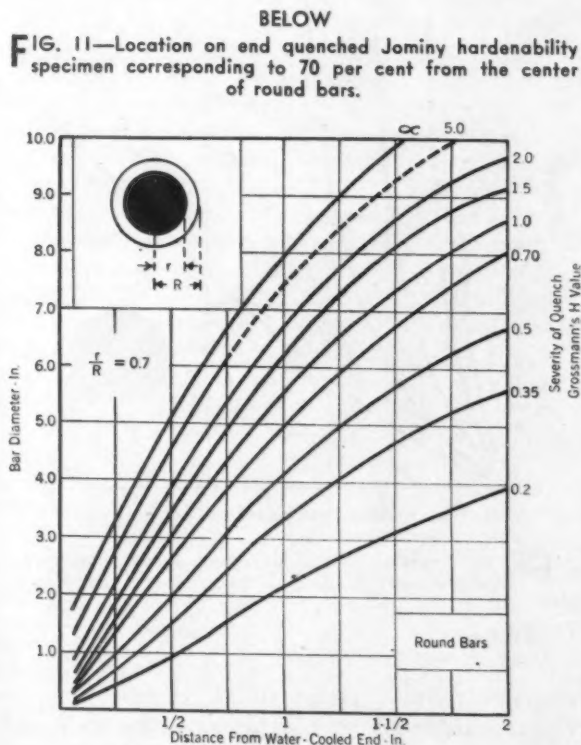


FIG. 11—Location on end quenched Jominy hardenability specimen corresponding to 70 per cent from the center of round bars.

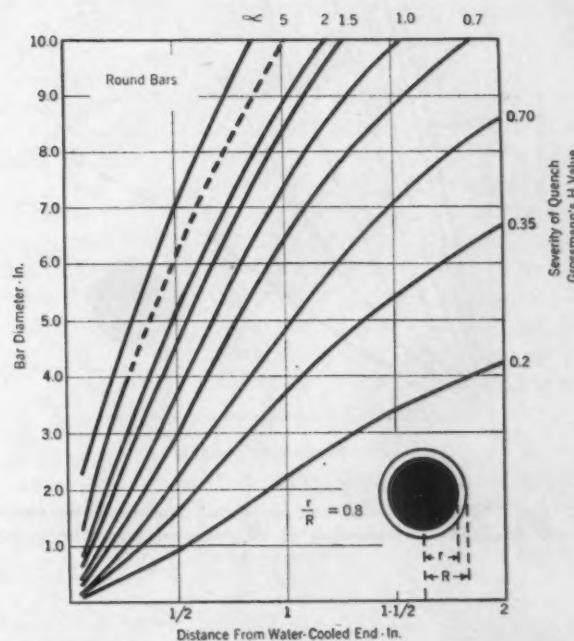


FIG. 12—Location on end quenched Jominy hardenability specimen corresponding to 80 per cent from the center of round bars.

the Jominy hardenability curve, the fractional distance curves and the above table of quenching severities. For example, suppose that the greatest change in the slope of the hardenability curve (a convenient location for selection of a hardness value) occurs at about $\frac{1}{2}$ in. from the water cooled end, and an agitated oil quench is to be used. It will be observed from the table that H values of from about 0.6 to 0.8 are obtained with this type of quench. Then by reference to Figs. 1 to 11, it will be seen that with this type of quench, a round

bar about 2 in. in diameter would harden at a fractional distance of $r/R = 0.3$ to the same degree as would the Jominy bar at a depth of $\frac{1}{2}$ in. A smaller sized bar might harden too deeply and a much larger bar would be uneconomical.

Depth of Hardening

It is often desirable to be able to predict the degree of hardening to be expected at specific locations in quenched round bars. Because of the importance of obtaining complete hardening through the entire bar, the

chart representative of the center position $\frac{r}{R} = 0$, Fig. 4 has been shown at a somewhat larger scale than the other diagrams. If optimum mechanical properties are to be developed in a steel, it is probable that for a certain severity of quench a bar should not be used, the diameter of which is larger than that which will harden at the center to a maximum hardness represented by the "shoulder" (about $\frac{9}{16}$ in. in the diagram in Fig. 1) of the Jominy hardenability curve.^{9,10} For example, suppose that a steel with the

hardenability characteristics shown in the diagram in Fig. 1 were to be oil quenched with a quenching severity of $H = 0.35$; then by reference to Fig. 4 it will be seen that maximum properties could be expected in bars whose diameters do not exceed $1\frac{1}{2}$ in.

It is sometimes advantageous to have a high surface hardness and a relatively soft core, particularly in applications in which high surface loading occurs. This would indicate complete hardening to some fractional depth between surface and center of the bar. For purposes of economy in selecting steel for such an application, it is helpful to be able to esti-

which maximum hardness is maintained to a Jominy depth of $\frac{9}{16}$ in., then by reference to Fig. 11 for a fractional distance of $\frac{r}{R} = 0.7$ it can be estimated that a severity of quench or H value of about 1.7 would be required. According to the table given above, this rate of cooling could be obtained by agitating the bar while quenching in water.

The hardness to be expected in the core, or at depths greater than 0.6 in. from the surface of this water quenched 4 in. in diameter bar may be estimated from Figs. 1 to 7. From Fig. 1 it will be seen that the Jominy

conversion to other shapes. Since the time of cooling is related to the surface and volume of the shape being quenched, the constants applicable to round bars cannot be applied to such shapes as square bars, flat bars, or plates. However, Russell³ has derived constants for plates and indicated a method of deriving similar constants for square bars and various sizes of flat bars. The relation of the Jominy hardenability test to the center of square bars, 1:2 flats, and plates are shown in Figs. 15, 16 and 17. With these diagrams, it is possible to predict from the results of Jominy tests the degree of hardening to be ex-

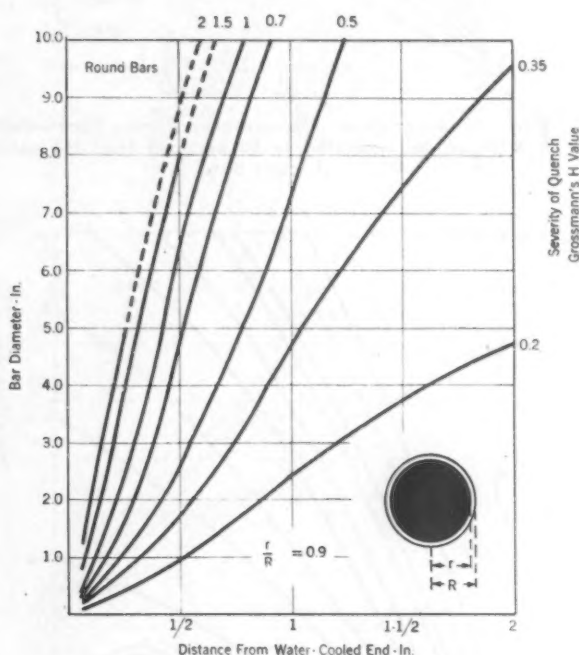


FIG. 13—Location on end quenched Jominy hardenability specimen corresponding to 90 per cent from the center of round bars.

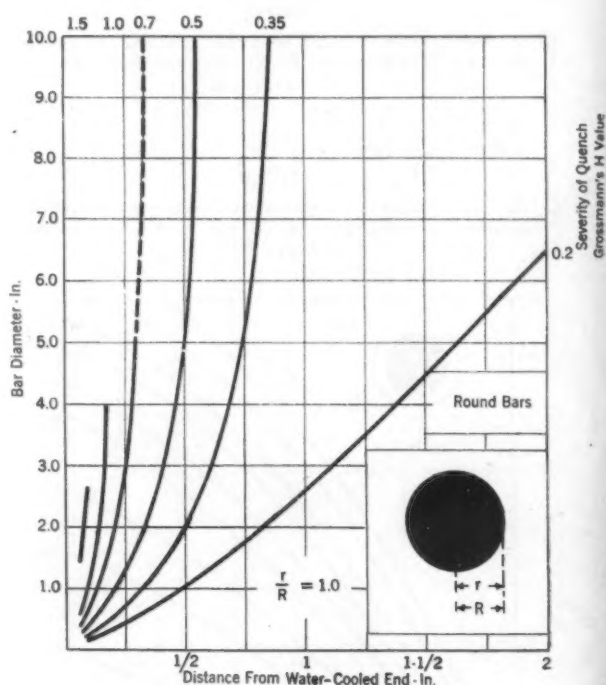


FIG. 14—Location on end quenched Jominy hardenability specimen corresponding to the surface of round bars.

mate whether a steel will harden to the required depth below the surface without undue hardening in the center. This may be done through the use of Figs. 2 to 11 in which is shown the relation between Jominy depth and bar size that will harden to various fractional distances between center and surface. For instance, assume service requirements are such as to require complete hardening to a depth of 0.6 in. below the surface of a 4 in. in diameter bar. This would mean that the steel would have to fully harden at a fractional

distance of $\frac{r}{R} = \frac{1.4}{2.0} = 0.7$ from center to surface. If the steel has a Jominy hardenability curve similar to that shown in the diagram in Fig. 1 in

depth of 1 in. corresponds to the center of a 4 in. rd. bar hardened with a severity of quench of $H = 1.7$. This Jominy depth in the diagram in Fig. 1 then indicates a center hardness in the bar of about 31 Rockwell C. From this it may be estimated that at depths greater than 0.6 in. from the surface, the hardness would decrease from about 50 Rockwell C at a depth of 0.6 in. to 31 Rockwell C at the center. The exact hardness for intermediate locations may be derived similarly from Figs. 5 to 10.

Square and Flat Bars, Plates

Although a number of investigators have discussed the relation between the Jominy test and round bars, relatively little has been published on

pected at the center of these shapes when hardened with quenching severities of $H = \alpha$, $H = 1.0$ (still water), and $H = 0.35$ (still oil). Although the relations are not given in the degree of completeness shown in the charts for round bars, an approximation sufficient to estimate roughly the extent of hardening may be gained from these diagrams.

Relation to Round Bars

In some instances when Jominy hardenability data are not available, it is desirable to be able to estimate the size of some shape that will harden to the same degree as that of another shape when quenched in the same manner. Without some index of hardenability such an estimation

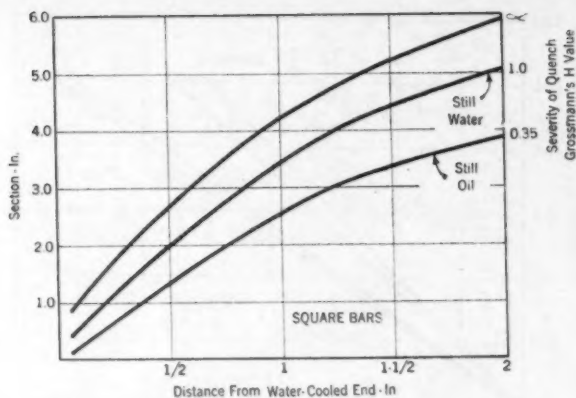


FIG. 15—Location on end quenched Jominy hardenability specimen corresponding to the center of square bars.

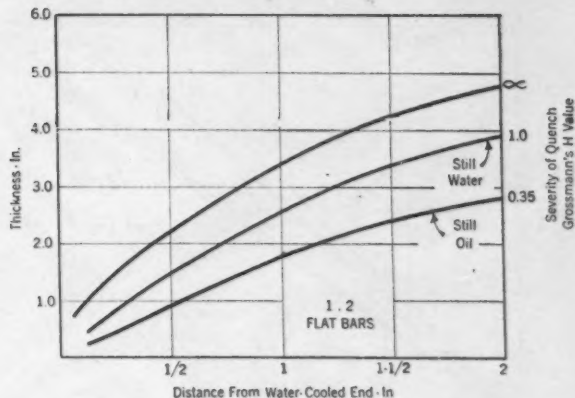


FIG. 16—Location on end quenched Jominy hardenability specimen corresponding to the center of 1:2 flat bars.

would be accomplished only by trial and error. However, using the relations previously discussed for hardenability, bar size, position in bar and severity of quench, it was possible to establish the direct relation for the center of square bars, 1:2 flat bars, plates and round bars for hardening with quenching severities of $H = \infty$ (infinite quench), $H = 1.0$ (still water), and $H = 0.35$ (still oil), as given in Figs. 18, 19 and 20.

With these diagrams it is possible to estimate the size of bar that will harden at the center to the same degree as that of another shape of known size when quenched with one of the illustrated quenching severities. For instance, if a 4 in. rd. bar will harden to 45 Rockwell C at the center after hardening with a quenching severity of $H = 0.35$, then, by reference to Fig. 20, a 3 1/8 in. square, a 2 11/16 in. thick 1:2 flat bar, or a 2 1/2 in. plate will harden to 45 Rockwell C at the center after being quenched in a similar manner. It will

be noted in the diagrams that the degree of hardening to be expected in square bars approaches that of a round bar, while the degree of hardening in 1:2 flat bars approaches that of plates. It will also be noted that the ratio between different shapes becomes less pronounced as the severity of quench becomes greater, so that it cannot be assumed that there is a fixed ratio between two shapes unless the severity of quench is the same.

Although these charts are based on constants developed from sound reasoning, their theoretical character should be remembered and estimations derived from them should be considered as first approximations. A limited number of experiments have been made to check the order of their accuracy, but extended trials have not been carried out. Some practical limitations may be expected. For example, the accuracy of the charts is questionable for very small sections. In large sections the actual center

hardness is often somewhat higher than that of the adjacent material and might be higher than is shown in the charts. There has been some suggestion that the effective H value changes slightly with different sized bars and different compositions. This might be expected in cases when there is scale on the bars or in cases when the coefficient of thermal diffusivity is affected by alloy content. It is also considered doubtful whether it is practically possible to produce the very thin hardened skin that is theoretically possible in shallow hardening steels. Although the applicability of the charts must be qualified, it is anticipated that they will permit estimation of depth of hardening with a useful order of accuracy.

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FIG. 17—Location on end quenched Jominy hardenability specimen corresponding to the center of plates.

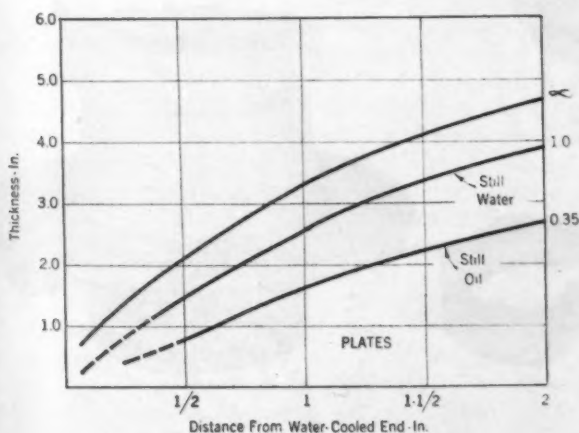
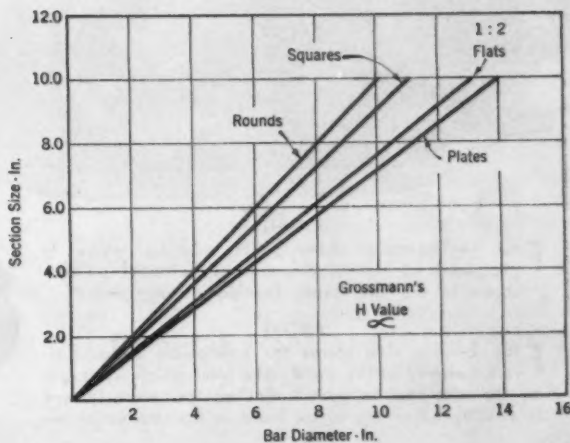


FIG. 18—Relation of round bar diameter to bar or plate thickness for an ideal quench ($H = \infty$).



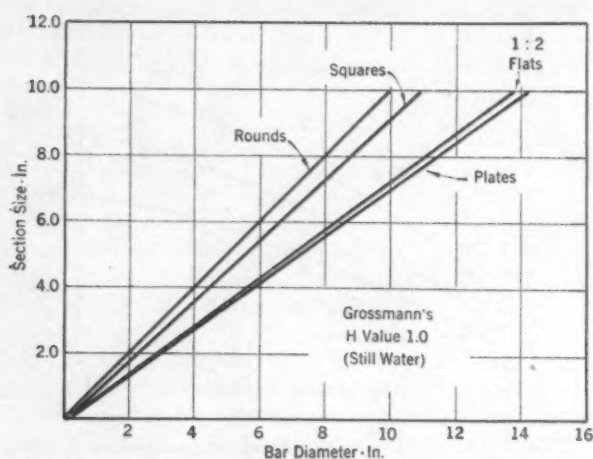


FIG. 19—Relation of round bar diameter to bar or plate thickness for quenching in still water ($H = 1.0$).

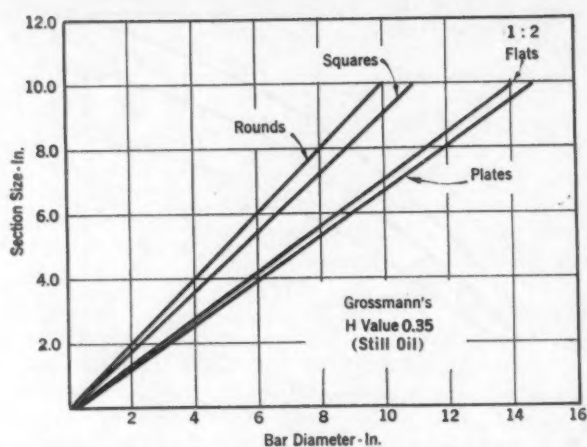


FIG. 20—Relation of round bar diameter to bar or plate thickness for quenching in still oil ($H = 0.35$).

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²M. Asimow, W. F. Craig and M. A. Grossmann, "Correlation Between Jominy Test and Quenched Round Bars," S.A.E. Trans., 1941, 36-49, pages 283-292.

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⁴M. A. Grossmann, M. Asimow, and S. F. Urban, "Hardenability, Its Rela-

tion to Quenching, and Some Quantitative Data," A.S.M. Publication, "Hardenability of Alloy Steels," 1939, pages 124-190.

⁵M. A. Grossmann and M. Asimow, "Hardenability and Quenching," THE IRON AGE, April 25, 1940, pages 25-29, and May 2, 1940, pages 39-45.

⁶C. B. Post, O. V. Greene, and W. H. Fenstermacher, "Hardenability of Shallow Hardening Steels," A.S.M. Trans., 1942, 30, pages 1202-1247.

⁷B. R. Queneau and W. H. Mayo, "Hardenability and Its Designation, The Hardenability Line," A.S.M. Publication,

"Hardenability of Alloy Steels," 1939, pages 237-249.

⁸A. L. Boegehold, "Use of Hardenability Tests for Selection and Specification of Automotive Steels," S.A.E. Trans., 1941, 36-49, pages 266-276.

⁹E. J. Janitzky and M. Baeyertz, "The Marked Similarity in Tensile Properties of Several Heat-treated Steels," A.S.M. Metals Handbook, 1939 Edition, pages 515-518.

¹⁰W. G. Patton, "Mechanical Properties of N.E., S.A.E., and Other Hardened Steels," Metal Progress, 1943, 43, No. 5, pages 726-733.

Collapsible Collar Saves Molding Time

USE of a collapsible collar pattern in molding a flanged fitting is reported to be saving considerable molding time and cost at the Ford Motor Co. of Canada, Ltd., of Windsor, Canada. This device, illustrated

here, is called a "snake" by Ford foundrymen. Conventional molding methods would have required the additional time and labor of additional coring or a three part flask.

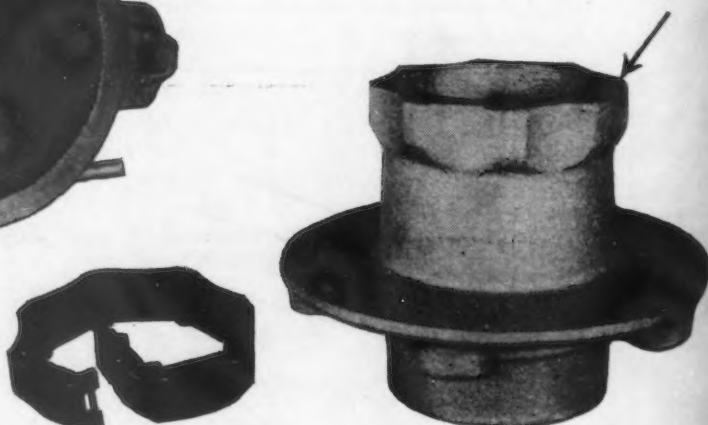
The "snake" and the casting are

shown in Fig. 1. This octagonal fitting, which is hinged at seven corners and fitted with a simple catch at the eighth joint. The hinges are arranged to permit the collar to wind inward. In use, this loose collar is placed over the pattern and rammed into the mold, as shown in Fig. 2. A wire tool with a hook on the end is then engaged in the catch on the eighth corner and the "snake" removed by winding it inward. This reduces its diameter and permits easy removal from the drag.



FIG. 1—The collar shown on the casting (arrow) is produced by use of the collapsible loose pattern shown to the left. Note the hinge arrangement.

FIG. 2—This view shows the collapsible collar pattern (arrow) in the mold. The joint which is caught by the wire tool to permit winding the collar inward is directly below the arrow head in the impression on the left.



Alloy Steel Specifications

... Based on Pet
Analysis or
Performance?

By GRESWOLD VAN DYKE,
Manager
Special Steel Department,
Joseph T. Ryerson & Son, Inc., Chicago



... Jominy hardenability test sample being quenched.

Since performance is the final measurement of the value of an alloy steel, why not market alloy steel on the basis of the most direct measurement of performance now available to industry—hardenability—instead of the present indirect method of chemical analysis? The logic of such a change, as well as its advantages, are discussed in this article.

FOR many years, steel users have been endeavoring to specify alloy steels on ever narrowing analysis ranges. Steel producers have constantly improved their manufacturing methods in an effort to meet this demand. In all probability, however, it would be very difficult to operate, on a commercially sound basis, and produce composition ranges more narrow than those in use today.

The performance of steel is in the main governed by its analysis. Performance may be defined as including machinability, response to heat treatment, required physicals, and other characteristics. Uniformity of performance is a desirable characteristic of any industrial product. Thus, the specifying of close analysis control has as its objective the procurement of steel which will be uniform in performance.

The control of steel performance by the analysis method is difficult, since all elements entering into the composition of steel have a plus or minus effect on its performance and, therefore, such control involves the manip-

ulation of all these elements by the steel maker.

In many standard steel analysis specifications some elements are controlled by top limits, such as phosphorous and sulphur. Other elements are controlled by both top and bottom limits, such as carbon, manganese, silicon, nickel, chrome, molybdenum, etc. This means that the steel maker's first consideration is to produce steel which is within the chemical limits. Under such a condition he cannot be also restricted by a performance specification because the purchaser of the steel has taken upon himself the responsibility of performance, provided that the steelmaker meets the specified chemical analysis.

If the steel producer knew the performance requirements of the customer and was told the *type* of steel that the customer wished to buy, it could work to the performance requirements of the customer, provided that reasonable leeway was granted on chemical analysis.

The scarcity of alloying elements caused by the war has rendered nec-

essary the development of entirely new low alloy steels to take the place of steels previously used which contained high percentages of alloys.

There was not sufficient time to check the performance of these steels by commercial use and therefore a method had to be adopted to evaluate their performance ability by a test which could be made quickly and yet give accurate results. This problem was solved by the use of the Jominy end quench hardenability test,* which has been applied in a sufficient number of cases to indicate its reliability in predicting how the steel would perform in standard or commercial applications.

The work done along these lines in connection with National Emergency (N.E.) steels has given impetus to a train of thought debating the desirability of specifying steels on a performance basis rather than on an analysis basis. The purpose of this article is to discuss some phases of this subject and to suggest how it can be applied to actual commercial practice.

* See "How to Interpret Jominy Test Results," THE IRON AGE, Feb. 11, 1943. Also "Metallurgical Control Through Calculated Hardenability," THE IRON AGE, July 1, 1943.

This method of specifying steel is making considerable headway and undoubtedly will be an important factor in the selection and purchase of steel in the future.

Most alloy steels are subjected to some form of heat treatment before being put to use. Therefore it is necessary that such steels be purchased with as accurate knowledge as possible of their ability to respond to heat treatment, or, as it is more frequently called, their "hardenability."

Factors of Hardenability

The hardenability of steel is principally controlled by its analysis. The surface hardness as developed by quenching is, in the main, controlled by the carbon content while the depth of penetration of hardness is largely controlled by the alloy content of the steel as well as the inherent grain size.

There are other factors, difficult to identify, which have an effect on the hardenability of steel. This is evidenced by the fact that two steels of almost identical composition and grain size will have different hardenabilities. This individuality in a heat of steel, which enables it to harden to a greater extent than other heats of similar or almost identical composition, is very hard to define and impossible to specify in terms of analysis or any other controllable factor.

Usually steel is purchased for certain requirements and certain degrees of hardenability are necessary to make it suitable for the application for which it is purchased. It would seem, therefore, that the logical way to specify the steel would be on the basis of its hardenability rather than going at this objective by the indirect route of specifying analysis and grain size.

There is nothing new in this method of buying steel to a hardness specification. In the early days of steel and before chemical analysis was understood or used, steel was actually sold on a hardenability basis. The old methods of manufacture were imperfect and not subject to close control. It was impossible for the steelmaker to predict just how a certain batch of steel would harden before it had actually been tested. For this reason, steel was sold on the basis of hardenability after being tested. Chemical composition, grain size, and the other factors which govern hardenability were not understood, and the final test, therefore, controlled the classification of the product and, in all probability, the price.

If the analysis and grain size of a certain heat of steel is submitted to a well posted metallurgist, he can, by calling on his past experience, make a very good guess at the physical properties which will be obtained

from the steel by a certain type of heat treatment.

If the physical requirements of the job permit a rather wide range of physical properties, after heat treatment, such a metallurgical prognostication may be satisfactory. If, on the other hand, rather accurate heat treatment is necessary, the only method of determining the suitability of the steel and heat treatment will be by actual test, involving considerable time and expense. It is possible that steel bought to a certain chemical specification might prove unsatisfactory for a particular application after the tests had been made.

A more logical method of specifying alloy steels would be to first select a certain type of steel; then instead of specifying the exact chemical composition, simply require that the steel have a certain specified degree of hardenability.

This method of buying steel would not necessarily mean any change in the type of alloy steel being used. Thus, if a manufacturer had been using A.I.S.I. A-3140 steel in the past, he would continue to specify, "A.I.S.I. Type A-3100" but would specify the hardenability instead of a full analysis range.

Prior to the advent of the Jominy end quench method, hardenability tests took considerable time and were expensive and most manufacturing plants lacked the necessary equipment to conduct them properly.

The Jominy test is simple, easy to conduct and remarkably accurate in its results. A thorough discussion of the Jominy test, how it is made and how the results can be interpreted is contained in the article, "How to Interpret Jominy Test Results," THE IRON AGE, Feb. 11, 1943.

The advantages of such a method of specification can be illustrated by the following example: Assume that based on past experience the steel selected for a certain application was A-3135. If the quantity involved is sufficient, two heats might be shipped from the producing mill. These two heats might have the analysis listed below as heat "A" and heat "B."

	Heat A	Heat B
Carbon	0.34	0.38
Manganese	0.62	0.76
Silicon	0.22	0.34
Nickel	1.15	1.40
Chromium	0.57	0.74
Grain size	No. 8	No. 5

It should be noted that both of these heats fall within the published analysis limit of A-3135. Obviously there would be a considerable difference in the hardenability of the two steels, particularly in the depth of

hardness penetration. It is quite possible to imagine that the heat "A" might be too low or heat "B" too high in hardenability for the application for which they are purchased, although they both would meet the specification A-3135, with grain size 5 to 8.

Had these steels been ordered as Type A-3100 with a reasonable hardenability range specified, known to be suitable for the application, both heats could be applied and satisfactory results obtained without change in the heat treatment.

It must be remembered that no mill can melt to an exact chemical specification and for this reason all steels are specified within a chemical analysis range. It is equally true that no mill could produce steel to an exact hardenability specification. Therefore, a hardenability range must be selected which will allow for normal production variation. If a reasonable hardenability range was specified and if the mill was not confined to a specific analysis range, it would probably have a better chance of furnishing a satisfactory product on the hardenability basis.

In carrying the idea of alloy steel specification on a hardenability basis to a logical conclusion, it would be interesting to speculate on the adoption of about 12 major standard alloy compositions which would be similar to the following types and would apply to most of the structural alloy steel now produced.

	Suggested Identification
Nickel Steel	
Type 2300	N-1
Type 2500	N-2
Chromium	
Type 52000	C-1
Molybdenum	
Type 4000	M-1
Chromium-Nickel	
Type 3100	CN-1
Type 3200	CN-2
Chromium-Molybdenum	
Type 4100	CM-1
Nickel-Molybdenum	
Type 4600	NM-1
Type 4800	NM-2
Nickel-Chromium-Molybdenum	
Type 9400	NCM-1
Type 8700	NCM-2
Type 4300	NCM-3

In these 12 suggested steel types the range of alloying elements would be considerably broader than those now used in specifying alloy steel. Carbon, of course, would be eliminated from the specification entirely and a simple system of letters or numbers could be adopted to identify the different analysis types.

If a quick hardenability test could be made on a heat of steel before tapping, then by furnace or ladle ad-

ditions the steel could be brought to the proper hardenability range and the inconvenience and expense of off heats would be materially reduced.

This idea may be reaching rather far into the future, but sufficient experimental work has been done to indicate that very interesting results can be secured from a cast sample by the Jominy method and that the results so obtained correspond very closely to those secured from finished bars of the same heat.

The time element required for making the Jominy test on a cast sample and the rate of loss of oxidizable hardening elements, such as chromium and manganese, would have to be closely coordinated so that the method would introduce some very interesting problems in furnace operation and control. There seems to be a general thought among producers and users of alloy steel that if such a scheme could be worked out it would be worth considerable time and effort to both the steel producer and to the user.

In order to pass on to customers of Joseph T. Ryerson & Son, Inc., the advantage of hardenability information, the company is now conducting Jominy hardenability tests on each heat of alloy steel as it comes from the producing mill.

From these tests, a chart is prepared showing the Jominy hardenability results of the heat in the "as quenched" condition and also at draws of 1000 deg. F., and 1200 deg. F.

These hardenability results are then interpreted for obtainable physical properties for bars 1, 2 and 4 in. round at the three draw temperatures indicated. These results are also put on the data sheets which are sent with each shipment of alloy steel from that particular heat.

This system furnished the customer a quick, accurate picture of the heat-treatment response which can be secured from the alloy steel which he has bought. It is believed that this information will effect a considerable saving of time and experiment in the customer's plant.

Obviously, the Jominy test as ordinarily run indicates the hardenability of the steel only in the "as quenched" condition. Most alloy steel is used after having been quenched and drawn and Ryerson has, therefore, devised a means for interpreting the Jominy test for steel which has been quenched and then drawn at 1000, 1100 and 1200 deg. F.

The method of doing this is to harden the Jominy sample in the normal fashion, using four samples and reporting the results on one



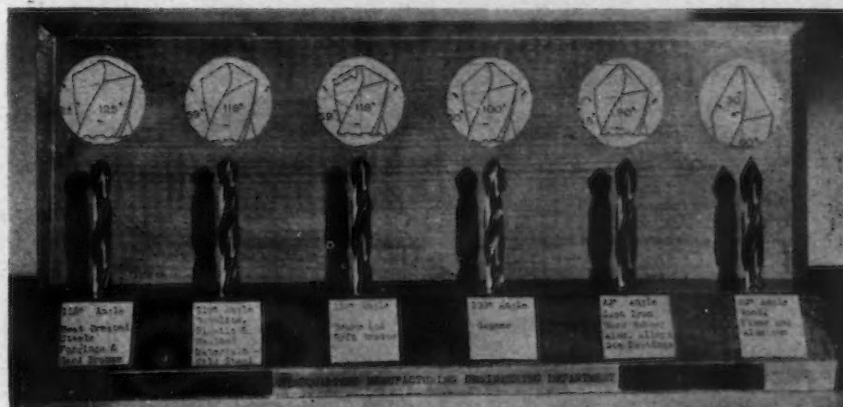
... Taking Rockwell C readings along the ground surface of a Jominy sample.

sample. Then draw the other three samples at 1000 deg. F., 1100 deg. F., and 1200 deg. F., respectively. After the samples have been drawn, the Rockwell hardnesses are then taken and from these the physical properties are developed.

On the back of each chart the detailed method of determining physical

properties from the Jominy curves is described. It is believed that this information will be interesting and helpful to all those who are interested in heat treating steel since it represents a new and very practical method of determining just what can be expected from any steel which is to be heat treated.

TOOL DISPLAY BOARD—To help conserve tools and to get maximum production from them it is necessary that they be properly sharpened. In order that a quick check-up can be made by drill press operators, several display boards showing the proper point angles for drilling various metals have been prepared by the Westinghouse headquarters manufacturing engineering department. These boards are placed near tool cribs and cutter grinders.





High Speed Milling In Aircraft Production

TWO phases of milling practice are receiving a great deal of attention today, particularly in the aircraft industry. One is the use of negative rake angles on carbide tipped blades used in milling high strength alloy steels; the other is the use of very high peripheral speeds for milling aluminum alloys. As the basis for a much more comprehensive research program proposed to be undertaken at California Institute of Technology, the Aircraft War Production Council, Inc., Los Angeles, has assembled data covering isolated tests and actual production runs in many of the West Coast aircraft plants. Most of the test work was done in cooperation with the Criterion Machine Works, Beverly Hills, Cal.; the Grayson Mfg. Co., Monrovia, Cal., and the Kearney & Trecker Corp., Milwaukee. The data from individual test reports are summarized in the accompanying table.

It is expected that the projected research program will be conducted under the direction of Prof. R. L. Dougherty of Caltech and that the costs will be underwritten by the Office of Production Research and Development of the WPB.

Test 1 covers a sawing operation performed on a No. 2 Cincinnati milling machine and is representative of traditional milling methods in this class of work (Fig. 1). Rake and helix angles are positive and the cutting speed of 86 ft. per min. is better than average for a high speed steel cutter. On the other hand, feed per tooth is somewhat low and the feed rate could have been doubled with no harm to

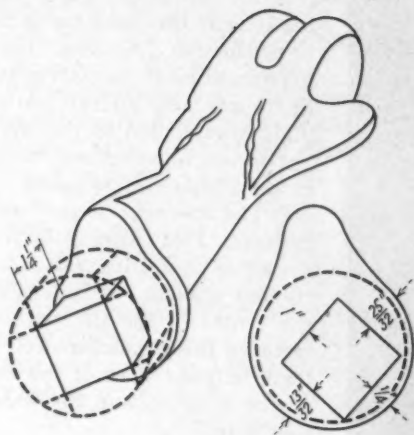
... Latest data on negative angle milling of alloy steel and high speed milling of aluminum have been compiled by the Aircraft War Production Council as a basis for a broad research program in the art of cutting metals proposed to be undertaken at the California Institute of Technology. While the data presented herein represent the present upper limit in milling practice, further experimentation will be necessary to provide satisfactory answers revolving around questions of speeds and feeds, as well as cutter construction, tip composition and cutting angles. In addition, such information will serve as a basis for machine tool modifications, clearly indicated as being necessary by the test data summarized in the table.

the cutter. Now compare the speed and feeds with those for the coarse tooth, carbide tipped milling cutter (Fig. 2), used in Test 2. Speed has been increased 20 times and feed 15 times. The chip load is nine times greater. Each tooth has a double negative helix angle so that the point of the tooth is a chip circling point. The double negative angle helps clear the chips from the sides of the cut, keeps the cutter aligned and reduces lateral vibration. In a demonstration run, this saw cut 200 ft. of SAE 3140 material at 20 in. per min. without disintegration of the cutter teeth. This is equivalent to a 3 hr. run. It is highly significant that the 3-hp. motor drew an actual load from the line of 15.3 hp. The No. 2 machine was steadied under this terrific overload by attaching a flywheel to the spindle arbor.

Tests 3 and 4 compare straddle milling of a square shank on the end of a forging (Fig. 3), with high speed steel vs. negative rake carbides. As performed according to traditional machining methods, this operation employs four 6-in. diameter staggered

tooth cutters (Fig. 4). Three of them have a 1-in. face and the fourth a $\frac{3}{4}$ -in. face. Feed and speed are in line with recommended practice for high speed steel, as is the chip load of 0.006 in. per tooth. The time required for conventional milling is 5 min. and 400 of these SAE 4130 pieces were milled between grinds.

It is interesting to compare this operation in production time with the hyper milling setup illustrated in Fig. 5 and tabulated as Test 4. As indicated in the illustration, the cutter assembly, clearly shown in this picture, consists of two half side mills and one staggered tooth twin half side milling cutter. All of these are 8 in. in diameter and are provided with 10 carbide tipped teeth. The same fixture is used for this operation as for the traditional method. All of the cutters have double negative angles, making possible a spindle speed corresponding to a peripheral speed of 632 ft. per min. The feed rate is $7\frac{1}{4}$ in. per min., which corresponds to a chip load of 0.0024 in. per tooth. The cutting time with negative angle mill-



ABOVE

FIG. 3—Tests 3 and 4 cover straddle milling of the square end of this SAE 4130 forging.

o o o

RIGHT

FIG. 1—Typical high speed steel milling saw operated in the conventional manner in a No. 2 Cincinnati miller. (Test 1.)



o o o

FIG. 2—Peripheral speed has been increased 20 times and the feed 15 times over the setup shown in Fig. 1, using the coarse tooth, carbide tipped cutter with negative rake and negative helix angles. (Test 2.)

o o o

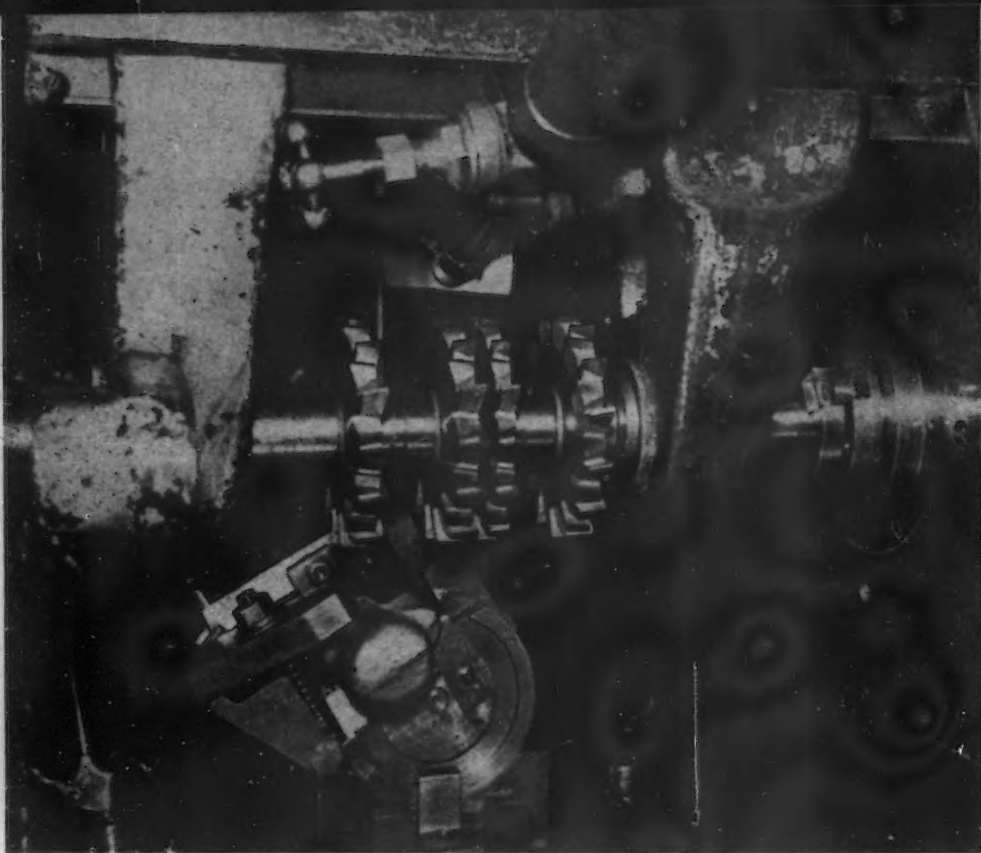


FIG. 4—Conventional setup for straddle milling the square end of the forging shown in Fig. 3. Four 6-in. staggered tooth H.S.S. cutters are used.

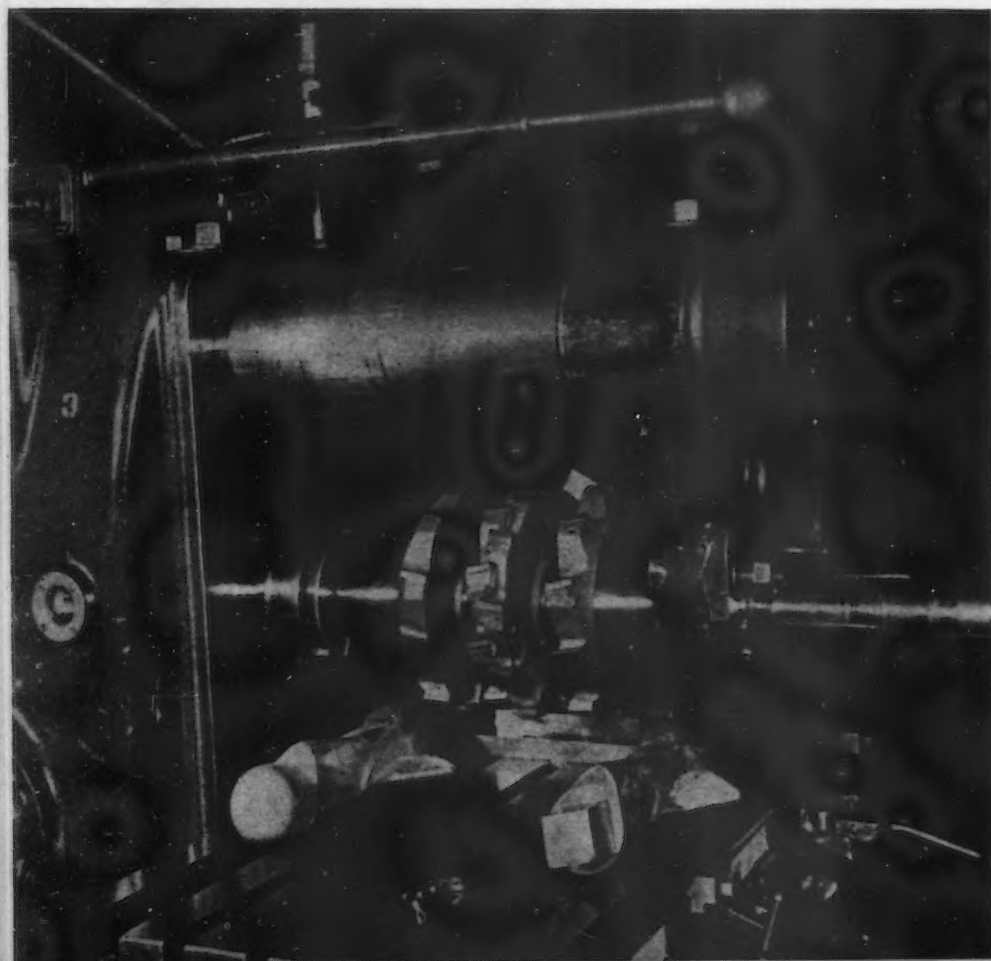
ing is 2 min., representing a production increase of 150 per cent.

Motor Greatly Overloaded

It was very obvious that the 10-hp. motor in the No. 3K milling machine

used was considerably overloaded. Instruments showed that 21 hp. was required. The vital machine elements were greatly overtaxed and such parts as the gearing and arm pendant bearings must be increased in strength and

FIG. 5—Hyper milling the square end of the part shown in Fig. 3. All the cutters have double negative angles.



capacity if this machine is to be used in production. However, the value of hyper milling in increasing production of chrome moly aircraft parts is strikingly brought out by this operation.

Test 5 is an excellent demonstration of the purpose of negative rake milling. The operation is performed climb fashion. This cutter is an interesting design as a slotting cutter and is extremely efficient. It is designed to cut the center of the slot with alternate teeth on the circumference. The side teeth mill the sides of the slot. Depth of cut is $\frac{3}{8}$ in. and the width of the slot $\frac{3}{4}$ in.

The power demanded of this 3-hp. machine was by actual meter reading 11.4 hp. This No. 2 machine should be considerably strengthened for such operations, including re-design of gears, spindles, bearings, etc.

The cutter used in Test 6, illustrated in Fig. 6, is typical of coarse toothed milling cutters made from boiler plate tipped with carbide. The six teeth have 21-deg. negative rake. Two pieces are beveled at a time in 30 sec., or 15 sec. per piece.

Fig. 7, Test 7, is interesting in that a single carbide bit is used in the form of a fly cutter to face a lug on a SAE 4130 forging. Because of the shock condition, a negative rank angle is employed, but the helix angle is zero. No production figures are available on this job.

The straddle milling operation, Test 8, is performed on a Cincinnati Hydromatic, powered originally with a 15-hp. motor, but because of this and similar operations, the company was forced to replace this motor with a 20-hp. motor. Approximately 0.211 in. of material is removed from each side of this work piece by this operation.

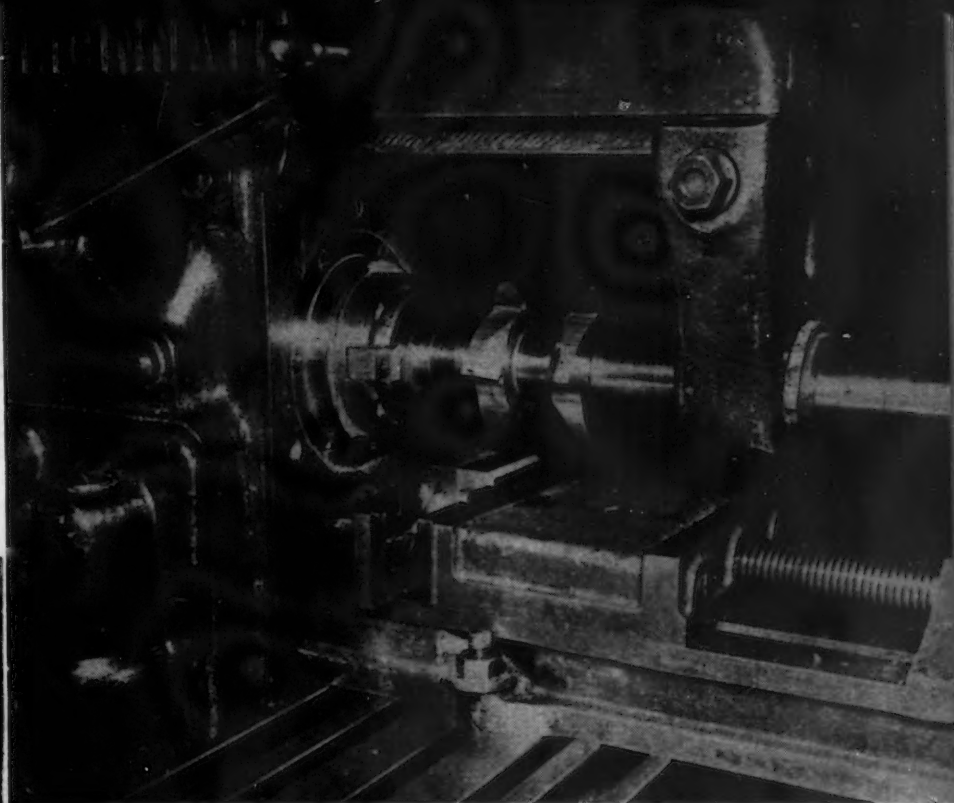
Production Upped 450%

By the traditional method, only seven parts per hour were possible. Negative rake milling in conjunction with an ingenious cam locking device fixture makes possible a production rate of 30 pieces per hr. This represents an increase of 450 per cent. Only 25 sec. are required for the cut on this piece which is approximately 7 in. long. The power required for negative angle milling under the conditions tabulated is 15 hp.

On Test 9, the face mill is 10 in. in diameter and 2 $\frac{1}{2}$ in. thick which provides sufficient flywheel effect for smooth operation with the relative coarse pitch tooth cutter. This is an important point in hyper milling. Under the conditions of the feed and speed, the production rate is increased approximately 200 per cent over the traditional method. The power for

this operation is 5 hp., representing approximately 70 per cent overload.

Two 6-in. diameter half side Grayson negative milling cutters were used for demonstrating Test 10, in which 0.125 in. of material was removed on each side of the plow steel piece and the depth of the cut was $1\frac{3}{8}$ in. Successful use of a feed rate of $12\frac{1}{4}$ in. on material that Brinnells at 215 is a remarkable demonstration of negative angle milling. The finish is a No. 3 in spite of the fact that from all appearances the machine in this opera-



ABOVE

FIG. 6—The cutter used in Test 6 (see table) is typical of a coarse tooth milling cutter made from boiler plate.



ABOVE

FIG. 7—Single carbide bit used in the form of a fly cutter to mill an SAE 4130 forging. (Test 7.)

o o o

RIGHT

FIG. 8—Setup for face milling an SAE 4140 forging on a No. 3K Milwaukee vertical miller. (Test 12.)

tion was overloaded. There was no appreciable tip damage at the end of this run. The power demanded for this cut was 15 hp., although only a 3-hp. motor drove this No. 2 milling machine.

Test 11, in which a billet of SAE 4340 was face milled at the same feed rate of $12\frac{1}{4}$ in. per min., is another example of where the machine was vastly overloaded. The power recorded during the cut was a fraction under 16 hp. This material also Brinnelled at 215.

Approximately 0.1875 in. of material is removed from the SAE 4140 steel forging in Test 12. The No. 3K vertical milling machine (Fig. 8) used for this purpose is equipped with a simple fixture. The 10-in. diameter face mill (Fig. 9) has 12 carbide tipped teeth with double negative angles. The body of the cutter is boiler

HIGH SPEED MILLING CUTTESTS

Test No.	MATERIAL CUT				Operation	Machine	Motor Hp.	Actual Hp.	CUTTER SPECIFICATIONS							Cutter Speed F.P.M.	P.S.F.
	Specifications	How Formed	Strength Lb./In. ²	Hardness					Body Material	Diameter In.	Thickness In.	Tip Material	Rake Angle Deg.	Helix Angle Deg.	No. of Teeth		
1	SAE 4130	Bar stock	91,000	205 Brinell	Sawing	Cinc. No. 2 Hor. Knee Type	3		H.S.S.	8	1/8	H.S.S.	+ 7	+ 7	4	41	
2	SAE 4140	Bar stock		210 Brinell	Sawing	Cinc. No. 2 Hor. Knee Type	3	15.3	Boiler Plate	6	3/16	Kennametal KM	-10	-10	1	529	
3	SAE 4130	Forging	91,000	205 Brinell	Straddle milling	Cinc. No. 4 Hor. Knee Type			H.S.S.	6	1	H.S.S.	+ 7	+ 7	13 Staggered	40	
4	SAE 4130	Forging	91,000	205 Brinell	Straddle milling	Milwaukee No. 3K	10	21	Boiler Plate	8	2 1/2	Kennametal KM	-10	-10	10	302	
5	SAE 4140	Billet		210 Brinell	Slotting	No. 2 Horizontal Knee Type	3	11.4	Meehanite	4		Kennametal KM	0	-10	1	529	
6	SAE 4130			205 Brinell	Beveling	No. 2 Horizontal Knee Type			Boiler Plate	5		Kennametal KM	-21	0	4	514	
7	SAE 4130	Forging		40 Rockwell C	Fly cutting (Facing)	No. 2 Horizontal Knee Type			Fly Cutter Arbor			Kennametal KM	- 7	0		355	
8	SAE 4140	Forging	91,000	205 Brinell	Straddle milling	Cincinnati Hydro-matic	20	15	Boiler Plate	10	2 1/2	Kennametal KM	-10	-10	12	245	
9	SAE 4130			210 Brinell	Face milling 4 bosses	No. 3 Vertical Knee Type	3	5	Boiler Plate	10	2 5/8	Kennametal KM	-10	-10	12	247	
10	Plow Steel			215 Brinell	Straddle milling	No. 2 Horizontal Knee Type	3	15	Meehanite	6		Kennametal KM	- 5	-10	1	529	
11	SAE 4340	Billet		215 Brinell	Face milling	No. 2 Horizontal Knee Type	3	16—	Meehanite	6 1/2		Kennametal KM	- 5	-10	1	529	
12	SAE 4140	Forging		205 Brinell		No. 3 Vertical Knee Type	3	10.5	Boiler Plate	12	2 5/8	Kennametal KM	-10	-10	14	202	
13	SAE 4335	Billet			Comb. face and circular milling	No. 2 Horizontal Knee Type	3	9	Meehanite	4	1 1/2	Kennametal KM	+10	+10	4 staggered 8 T	529	
14	SAE 4140	Forging		205 Brinell	Sawing	Cincinnati Bed Type	20	18.6	Boiler Plate	16 1/2	0.340	Kennametal KM	0	- 5	20	135	
15	SAE 4130	Forging		210 Brinell	Face milling	No. 2 Vertical Knee Type			H.S.S.	6		H.S.S.	+ 7	+ 7	10	40	
16	SAE 4130	Forging	90,000	205 Brinell	Face milling	No. 3 Vertical Knee Type	10	18	Boiler Plate	10	2 1/2	Kennametal KM	-10	-10	12	247	
17	SAE 4130	Forging		210 Brinell		No. 3 Vertical Knee Type	10	32+	Boiler Plate	10	2 1/2	Kennametal KM	-10	-10	12	1,000	
18	SAE 4130			41 Rockwell C		No. 2 Horizontal Knee Type			Meehanite	6	1	Kennametal KM	-10	-10	1	425	
19	SAE 4130			205 Brinell		No. 2 Horizontal Knee Type			Steel	8	1 1/4	Vascoloy EM	0	+ 7 1/2	10	293	
20	Alloy Steel			32 Rockwell C	Facing with fly cutter	Hand Mill			Tool Bit	(3/8 x 3/8 x 2 1/2)		Vascoloy EM	- 5	- 5	1	7,000	
21	Aluminum	Sand casting				No. 1 Horizontal Knee Type				2-6 Staggered		H.S.S.	+ 7	+ 7	18 on side	800	
22	Aluminum	Sand casting			Straddle milling	No. 1 Hor. Bed Type Hy-Cycle	15		Boiler Plate	8	3/16	Firhite HA	+10	0	10	7,000	1
23	24 ST	0.410 in. bar			Face milling	No. 1 Vert. Bed Type Hy-Cycle	15		Boiler Plate	2 1/2		Carboloy 44A	+10	+10	4	8,500	
24	24 ST				Sawing	No. 1 Hor. Bed Type Hy-Cycle	15		Steel	4		Carboloy 44A	+10	0	10	8,000	
25	24 ST				Slab milling	No. 1 Vert. Bed Type Hy-Cycle				2 3/4		Firhite HA	+10	-15	1	8,000	
26	Asbestos Brake Lining				Slab milling	No. 1 Hor. Bed Type Hy-Cycle	15		H.S.S.	2 1/2	6	H.S.S.		+52	1	8,000	
27	14 ST	Extrusion			Sawing	No. 1 Hor. Bed Type Hy-Cycle			Boiler Plate	8	3/16	Firhite HA	+10	0	10	8,000	1
28	Dural					No. 2 Horizontal Knee Type			H.S.S.	6		Carboloy 44A	+10	-10	4	1,200	
29	24 ST	Bar stock			Sawing	No. 1 Hor. Bed Type Hy-Cycle			Boiler Plate	6	1/8	Kennametal KM	+10	0	1	7,000	1
30	24 ST	Gussets			Scarfig	No. 1 Vert. Bed Type Hy-Cycle	15		Cast Iron	2 3/4		Firhite HA	+10	-15	1	8,000	
31	Aluminum	Sand casting			Slotting	No. 1 Hor. Bed Type Hy-Cycle			Boiler Plate	8	5/8	Firhite HA	+10	+10	1	5,000	1
32	Aluminum	Sand casting				No. 1 Vert. Bed Type Hy-Cycle	15		Cast Iron	4		Firhite HA	+20	+20	1	10,000	1

NOTE: Underscored test data represent accepted practice with high speed steel cutters.

TESTS ON AIRCRAFT MATERIALS

No. of Tests	Cutter Speed F.P.M.	Periph. Speed F.P.M.	Feed In./Min.	Chip Load In./Tooth	Type of Cut	Depth of Cut In.	Length of Cut In.	Cut Time Sec.	PRODUCTION			NOTES
									Present Pcs. 1 Hr.	Former Pcs. 1 Hr.	Increase Per Cent	
41	86	13½	0.0007	Conventional								Representative of standard milling practice.
529	833	20	0.006	Climb	½ x ¾							Cut 300 ft. before cutter dulled, equiv. to 3 hr. run. Fly-wheel attached to spindle arbor to take terrific overload (5.1 x). Demonstration only: not a production job.
40	63	3	0.006	Conventional				300				4 cutters in setup. 400 pcs. milled between grinds.
302	632	7½	0.003	Climb				120			150	2 half side mills and 1 staggered tooth mill used in setup.
529	553	15¾	0.005	Climb	¾ x ¾							Cutter has double negative helix with step tooth in center.
514	520	11	0.005	Climb	0.200 x 45°							
355	276	2½			0.020							
245	642	17	0.006	Conventional	0.1875	7	25	30	7	450		Orig. 15-hp. motor replaced by 20-hp. motor. Cam locking fixture used to reduce floor-to-floor time.
247	647	17.5	0.006		¾ x 1½						200	Cutter body has flywheel effect.
529	830	12¼	0.003		½ x 1¾							2 half side Grayson negative milling cutters used on this run: no damage to teeth. No. 3 finish obtained.
529	885	12¼	0.003		0.100							Machine greatly overloaded: finish excellent.
202	606	17½	0.006		0.1875		20					Chips came off red hot.
529	553	12¼	0.006		0.125							Finish excellent, though machine is much overloaded.
135	583	8	0.002	Plunge	0.340 x 5¾	2½	120					Orig. 15-hp. motor replaced by 20-hp. motor. Chip load too low for good results. 40-60 pcs. sawed bet. grinds.
40	60	2	0.0003	Conventional	0.125				3+			These two operations are on same forging. Excellent finish with negative rake milling; 60 pcs. milled bet. grinds as compared with 400 with H.S.S. cutters.
247	647	12½	0.004	Conventional	0.125				10	3+	200	
1,000	2,620	60	0.005	Conventional	0.125				40			Power reading taken at 42 in. feed; power at 60 in. feed undetermined.
425	662	19¾	0.006	Plunge			8				150	2 one-half side cutters used.
293	612	11 30	0.003 0.008	Climb	0.043 x 2						200	2 one-half side cutters used.
7,000	3,500	30	0.004	Conventional	⅛ x ⅝ x ⅝				200			No signs of tip wear after milling 2,400 pieces. Material is a shock resistant alloy steel.
900	1,350	150	0.010		⅛							These two tests are comparable.
7,000	14,700	110	0.0015	Climb	0.125 Each side		3				500	
8,500	5,070	100	0.003	Climb	0.270 x 1.160	1						Shell end mill used.
9,000	9,400	Hand feed	0.002	Conventional	¾ Saw cut	Up to 12 ft.						
8,000	5,740	30 Hand feed		Taper	0.081 -0							
9,000	5,900	225	0.003	Climb	0.136 -0							
9,000	18,900	225	0.003		6 x 4 x ¾							Air operated fixture used.
1,200	1,800	30	0.007	Conventional	0.030							
7,000	11,000	150	0.003	Climb	¾ x 1½ x ⅝							Grayson slitting saw used. Pneumatic vise.
8,000	5,470	150	0.010	Taper	0.050		6	120				
5,000	10,490	75	0.015	Climb	0.0625		8					
10,000	10,450	100	0.003		0.125							



FIG. 10—Combination Meehanite body cutters used in Test 13. In effect the cutter is an end mill combined with a plain cylindrical cutter.

plate material 2½ in. thick and weighs over 50 lb. The spindle speed corresponds to 645 ft. per min. and a feed of 15 in. per min. reduces the cutting time to 20 sec.

A production job, this operation is also performed with a 12-in. diameter cutter made of 2½ in. boiler plate body having 14 teeth with tips induction brazed. Some of these tips are brazed with silver solder and some with No. 3 Easy Flo and some with Castolin Eutectic metal. The greater flywheel effect with the larger cutter body apparently results in smoother operation of this milling operation.

Since the work piece is only 3.615 in. wide, a 4-in. diameter cutter could be used. If the milling machine equipment were adequate for the increased speeds of negative rake milling, the larger cutters could be replaced by

smaller cutters and thus result in more economical operation.

The No. 3 milling machine used seems adequate for this operation, although the power reading for this operation was 10.5 hp. The chips are red hot.

The interesting cutter used for Test 13 is shown in Fig. 10. It can be used either as plain circular mill or as end mill. In this operation one cut is equivalent to a circular mill cut on a flat surface and the other cut is equivalent to a shell end mill operation. Both angles on the cutting edges are positive. It is the equivalent of four teeth staggered so that the combination cutter presents eight teeth to the workpiece. The finish is excellent, corresponding to a No. 3, which is obvious from the illustration. The



FIG. 9—The cutter used in Test 12 (see Fig. 8) has a body made of boiler plate, 12 in. in diameter and 2½ in. thick, giving considerable flywheel effect.

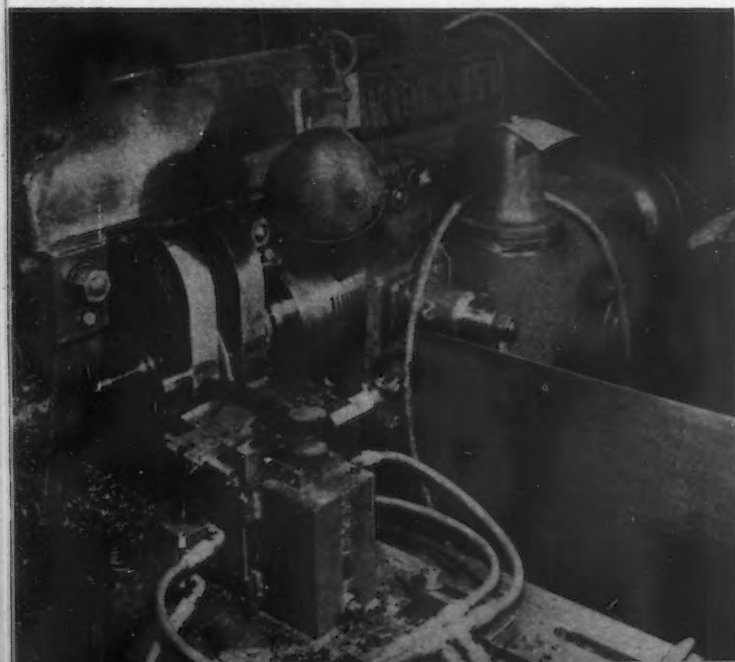


FIG. 11—Pneumatically operated clamping fixture used in Test 14. Such a fixture is essential in reducing the proportion of loading and unloading time to actual cutting time in hyper milling.

cutter tips show some slight damage at this stage of the operation.

The No. 2 milling machine is again much overloaded at 529 r.p.m. and 12¼ in. feed. The analyzer indicated 9 hp. The no-load power for the No. 2 machine with the spindle running at 2000 r.p.m. is 1.7 hp. and at 553 r.p.m. the power input is 0.9 hp.

Sawing in 1/36th Time

The remarkable sawing operation covered in Test 14 is well illustrated in Figs. 11 and 12. Fig. 12 shows the 16½-in. diameter saw, 0.340 in. thick. The teeth are staggered and have 5-deg. negative helix. Fig. 11 shows the

pneumatically operated clamping fixture for quick loading and unloading of this workpiece. The pivoted jaws are locked and unlocked by means of air operated pistons. Approximately 500 lb. of pressure are available for the clamping of this workpiece.

The cut is approximately 6 in. long, $2\frac{1}{2}$ in. deep and 0.340 in. thick. Plastic guides are used to prevent excessive lateral vibration of the saw and the tracks left by these guides are clearly shown in Fig. 12. The milling machine was originally equipped with a 15-hp. motor, which was replaced by a 20-hp. Unfortunately, a larger arbor with larger diameter bushings supporting the saw cannot be used because of the depth of cut. This keyed setup should be replaced by a splined arbor and arbor support bearings of greater capacity.

The machining time for this operation has been reduced from 75 min. to 2 min. This striking increase in production is possible only because of the

FIG. 12—To prevent excessive lateral vibration, plastic guides are brought to bear against the sides of this $16\frac{1}{2}$ diameter saw, which in Test 14 was operated at 583 surface ft. per min. in cutting SAE 4140.

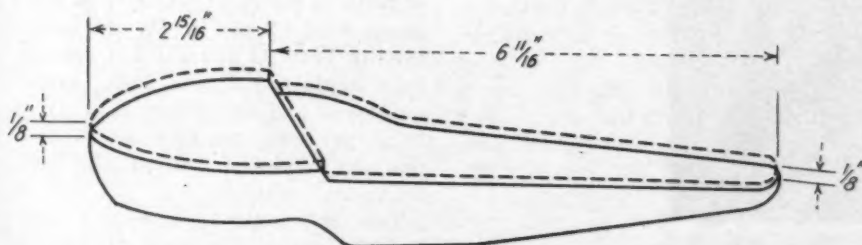
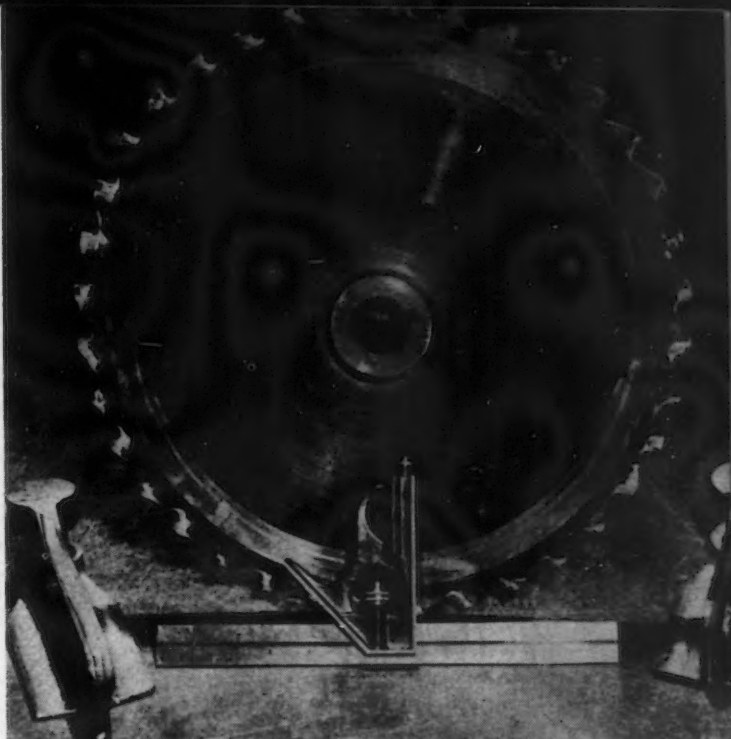


FIG. 13—SAE 4130 forging milled in comparative Tests 15 and 16.

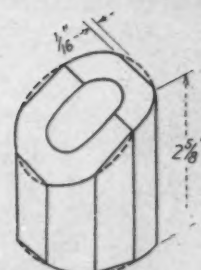
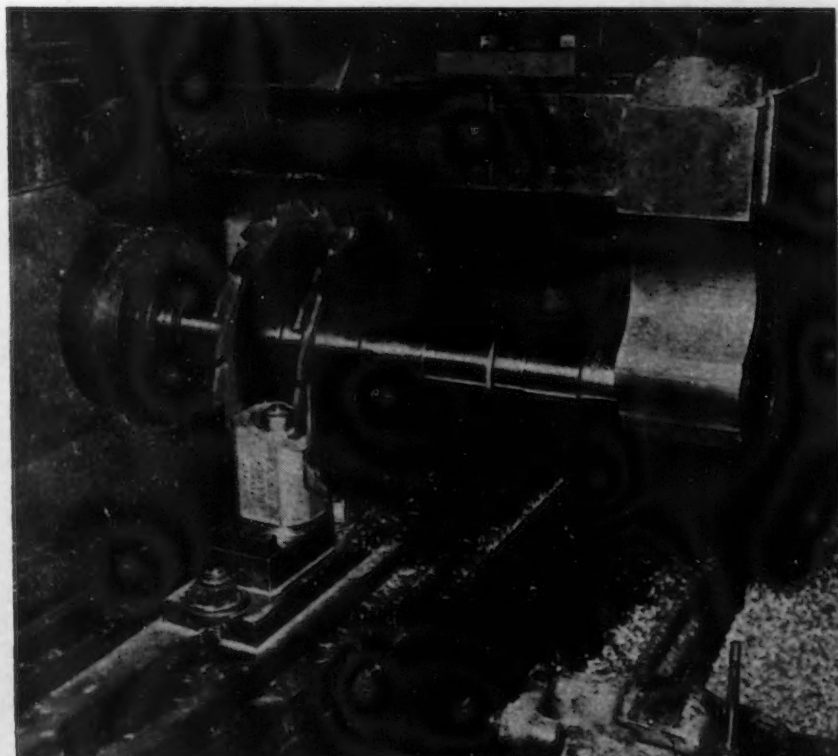


FIG. 14—Aluminum alloy sand casting milled in Tests 21 and 22.

FIG. 15—Straddle milling setup for Test 22 in which an aluminum casting (Fig. 14) was milled at 14,700 ft. per min. with carbide tipped cutters.



negative angle method of milling. This operation could, however, be considerably improved if more power were available in a machine that would accommodate a larger saw, a larger arbor, and therefore more rigid operation throughout. This is a striking instance of the necessity of re-designing milling equipment.

The chip load is only 0.002 in.—too low for good results. Only 40 to 60 pieces are sawed between grinds. An increase in the chip load will increase cutter life, since it prevents a burnishing action. The feed of 8 in. per min. cannot be increased because of milling machine limitations.

Tests 15 and 16 compare conventional and hyper milling on the same piece (Fig. 13). This workpiece is an SAE 4130 untreated forging with a tensile strength of approximately 90,000 p.s.i. and a Brinnell reading of 205. The face milling operation is performed on a 3K vertical milling machine at a spindle speed of 247 r.p.m. corresponding to 647 surface ft. per min. and a $12\frac{1}{2}$ in. feed which is the equivalent of a chip load of 0.004 in. The depth of cut is 0.125 in.

The face mill as shown in the illustration is a 10-in. diameter boiler plate body $2\frac{1}{2}$ in. thick; the tips are



FIG. 16—Asbestos strip being slab milled with a high speed steel cutter at a cutting speed of 5900 ft. per min. (Test 26).

K.M. and have double negative angles, 10-deg. rake and 10-deg. helix.

Air-Operated Fixture Used

A two station fixture is used for loading and unloading, but in order to reduce the loading and unloading time a pneumatically operated fixture is suggested. This will bring the loading and unloading time into relationship with the decreased cutting time made possible by negative rake milling. By negative rake milling, 10 pieces per hr. are possible. This includes the milling of the two steps shown in the illustration. The increase in production over the conventional process is more than 200 per cent. Finish is improved to the extent that a grinding operation is eliminated.

Approximately 60 of these workpieces can be milled between grinds using negative rake, whereas 400 pieces are possible between grinds using high speed steel cutters. However, no conclusion should be drawn from these comparative figures. Grinding of cutters must be standardized and bettered.

The power for this hyper milling operation is indicated as 18 hp. Obviously the 10-hp. motor on this No. 3

milling machine is greatly overloaded, likewise the machine itself.

The operation in Test 17 corresponds to that shown in Test 16. Here the speed and feed rate have been increased to determine experimentally the results of higher surface feet and chip load rates. The spindle speed has been stepped up to 1000 r.p.m., equivalent to 2620 f.p.m.; the feed is 60 in. per min., which corresponds to a chip load of 0.005 in. The depth of cut is again 0.125 in.

The same face mill cutter was used. Under these extreme speed and feed rates, the production has been increased to 40 pieces per hr. Approximately 12 pieces can be milled between grinds.

Flywheel Effect

The large diameter cutter body $2\frac{1}{2}$ in. thick provides sufficient flywheel effect at these high speeds so that the operation is remarkably smooth. The finish is improved. At the higher spindle speeds there is apparently less damaging effect to the spindle from the impact blow of the teeth. The effect upon the gearing, however, remains to be determined. The following interesting analysis was

made of the electrical input at 545 r.p.m. and 52 in. feed:

Volts	460
Kw.	28
P.f.	0.86
Amp.	37
Actual hp.	32

It should be noted that these readings were taken at 545 r.p.m. and 42 in. feed. The electrical analyzer was not available when this No. 3K vertical machine was operated at 1000 r.p.m. and 60-in. feed rate, but it is obvious that the 10-hp. motor was overloaded more than 200 per cent. Even in Test 16, the motor was overloaded approximately 80 per cent.

In Test 18, two 6-in. diameter half side cutters with Meehanite bodies were used in a plunge cut. Here again, the high feed and peripheral speed rates used make possible extremely high production, in this instance 150 per cent over the traditional milling method.

Test 19 indicates that even with cutters having a fairly large number of teeth (2 per in. of diameter as compared with 1.2 per in. for the cutter used in Tests 17 and 18) and positive helix angle and 0 rake, high peripheral speed and high feeds, from 11 to 30 in. per min., can be used. Production was increased 200 per cent over traditional methods.

Test 20 should be compared with Test 7, since it is another fly cutting job with a single cutter. Both the cutter speed and the feed have been stepped up tremendously. After 2400 shock resistant alloy steel castings had been milled, the carbide bit still needed no regrinding.

Milling Aluminum

Tests 21 and 22 compare milling of an aluminum sand casting (Fig. 14) with a high speed steel cutter operating at 1320 f.p.m. with a carbide cutter operating at 14,700 f.p.m. Positive rake angles are used in both cases. A 7000 r.p.m. hy-cycle motor drives the special cutter spindle of the No. 1 bed type miller.

It will be noted from the illustration (Fig. 15) that two saws are put together to form one cutter, the outer supporting the inner. This cutter operates in climb fashion and is setup for an extremely high production rate as is evident from the spindle speeds and feed rates. An increase in production of 500 per cent is claimed for this operation over traditional methods.

In Test 23, the workpiece of 24ST material is face milled on a No. 1 bed type machine equipped with a special vertical spindle and powered by a 15-hp. hy-cycle water-cooled motor.

The spindle speed of 8500 r.p.m. corresponds to a surface speed of 5070 ft. per min. The table feeds the work piece into the cutter at a rate of 100 in. per min. which is equivalent to 0.003 in. chip load. The depth of cut is 0.270 in. and the dimensions of the cut section are 0.75 x 1.16 in.

Air vise jaws make up the fixture used for rapid loading and unloading. Positive rake and helix angles are used on the 2½-in. diameter shell end mill, the four teeth of which are tipped with Carboloy 44A.

Test 24 was also performed on a No. 1 bed type horizontal milling machine equipped with special spindle powered by 15-hp. hy-cycle motor. The spindle speed is 9000 r.p.m. which corresponds to a surface speed of 9400 ft. per min. The operation is that of slitting 0.410 in. round rods which are fed by hand at a rate corresponding to a chip load of 0.002 in. per min. The operation is performed conventional style and the cutter teeth are tipped with Carboloy 44A.

Hy-cycle equipment is expensive and not entirely satisfactory, according to the AWPC report. High spindle speeds should be provided by other means. Spindle bearings operating at these speeds fail frequently.

Test 25 is another hy-cycle job, using a two-bladed cutter tipped with Firthrite. The chief point to be noted is that a 15-deg. negative helix angle is employed in conjunction with 10-deg. positive rake.

Test 26 covers a somewhat similar job except that asbestos strip material is being surfaced as shown in Fig. 16. The material is tapered from 0.136 in. to a feather edge. Again the machine used is a No. 1 bed type equipped with a horizontal special spindle and equipped with a 15-hp. hy-cycle motor.

The r.p.m. is 9000 and the corresponding peripheral speed is 5900 ft. per min. The table is fed at rapid traverse rate of 225 in., corresponding to 0.003 in. chip load. A high speed steel slab mill with 52 deg. spiral angle teeth is used for this surfacing operation, and an air clamp fixture is used to reduce the loading time.

Further Experimentation Needed

What speeds and feeds can be used on such materials as asbestos and plastic? These questions must be answered by further experimentation and a full-fledged program of research.

Test 27 on 14ST extrusions was made on the same machine as for Test 26. The cutter was much larger so the peripheral speed is correspondingly higher, in this instance 18,000

ft. per min. Rapid traverse rate of 225 in. per min. was retained.

This remarkable operation indicates clearly the possibilities of high spindle speed milling of aluminum. Before the cutter showed signs of tip disintegration, 60 cuts were taken.

The air operated vise (Fig. 17) is necessary for this and similar high speed operations to bring loading and unloading time into reasonable relationship with cutting time.

Test 28 was performed on a conventional No. 2 knee type miller and is in line with accepted, current practice. Test 29, in which ¾ x 1½ in. 24ST bar stock was slit, was carried out on a No. 1 bed type horizontal milling machine equipped with a special spindle powered by a hy-cycle motor, similar to the equipment used for Tests 26 and 27. The spindle speed of 7000 r.p.m. corresponds to a peripheral speed of 11,000 ft. per min. and the feed rate of 150 in. per min. gives a chip load of 0.003 in. per tooth, which is a good working average.

In Test 30, 24ST aluminum gussets are scarfed on the same machine as used in Test 25 and with the same cutter. The only difference is that the feed rate is higher, being 150 in. per min. corresponding to a chip load of 0.009 in. per min.

The negative helix angle in this operation assists in holding the workpiece flat against the fixture base. The fixture itself is a simple manually operated vise with four clamping jaws that hold the workpiece flat against the fixture. Only 6 sec. are required for this cutting, 25 sec. from piece to piece.

A detailed study of the electric power input for such aluminum operations as this needs to be made. It was impossible to do so at the time these observations were recorded.

Test 31 is another hy-cycle job in which an aluminum sand casting is slotted. The spindle speed of 5000 r.p.m. corresponds to 10,497 ft. per min. The feed rate is 75 in. per min., corresponding to a chip load of 0.152 in. The cutter is of boiler plate material and its ten teeth have positive helix and positive rake angles. They are tipped with Firthrite grade HA. This was the first application of a model air cylinder to a milling fixture before a double barrel vise was made like the one shown in Fig. 17.

Test 32 indicates that even with fairly large positive rake and helix angles, high peripheral speeds can be safely used, provided the feed rate is high enough to maintain a healthy chip load.

FIG. 17—Sawing of 14ST extrusions (Test 27). Note the air operated vise used on this No. 1 horizontal bed type miller which was equipped with a special hy-cycle motor.



... Hardness Testing



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THE long list of portable hardness testing instruments has been augmented in the last year or two by the addition of the new, rather handy and comparatively inexpensive "Barcol Impressor". This apparatus has been developed and is being marketed by Barber-Colman Co. of Rockford, Ill., and has found application in many war industries for the testing of certain raw materials, some plastics, as well as various parts or finished assemblies. Users and makers claim particular value of the instrument in segregating or differentiating materials of similar appearance. Before delving into the technicalities of the new tester, it should be realized that no claims for universal adaptability have been set forth by the makers.

The Barcol Impressor test is based on indentation of a truncated cone penetrator ground from a 0.1244 in. diameter steel round of 1.340 in. length, which has been previously

hardened to a minimum of 66 Rockwell C. The impressor tip or "point" has been ground to 0.00625 in. diameter and to an included angle of 24 deg. As shown in Fig. 1, the penetrator fits snugly into a hollow spindle, the former being held down by a spring loaded plunger. The spring has a free height of 1.000 in. and an outside diameter of approximately 5/16 in. By careful heat treatment it has acquired the following average characteristics:

TABLE I

Deflection, in.	Load, Lb.
0.100	4.7
0.200	9.6
0.300	14.4
0.400	19.4
0.500	24.3
0.505 (solid)	24.6

The depth of penetration is transmitted by the movements of a lever onto the stem of a 1½ in. diameter indicator, its dial being divided into 100 arbitrary graduations. The complete assembly is shown in Fig. 2. The operation of the Barcol is extremely simple. The leg plate is first set against the tested surface and gentle pressure (about 16 lb.) applied against the point by pressing on the die cast housing of the impressor. The hardness number is read directly on the indicator. The pressure transmits a load on the impressor, which in turn penetrates into the tested material, leaving a very small but measurable indentation on the tested surface. Studies made by the writer with indentations corresponding to various hardnesses gave some idea of the size of the indentation produced. By referring to the photomicrographs in Figs. 3, 4 and 5, it will be noted that the diameters of the impressions vary

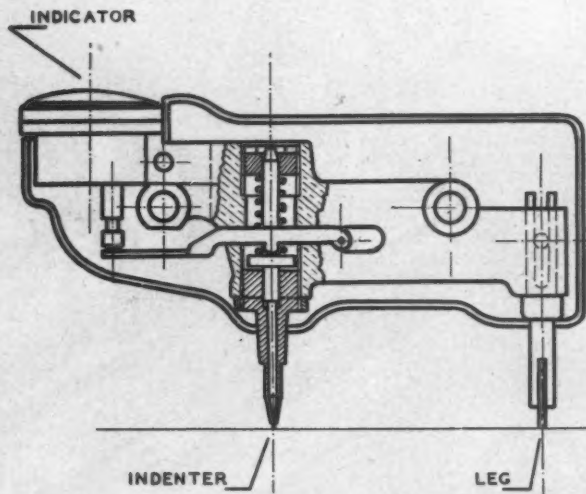
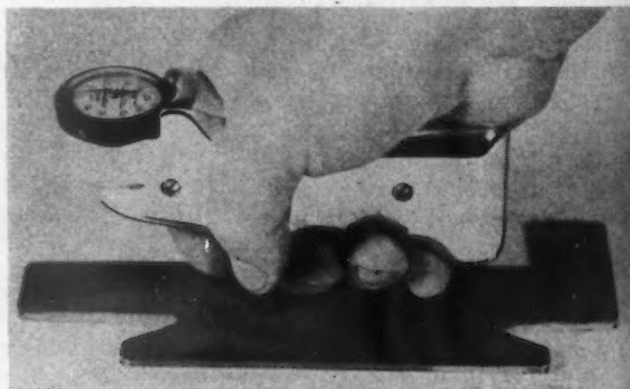


Fig. 1—Construction of the Barcol hardness tester.

FIG. 2—In applying the Barcol hardness tester to a test piece, the leg plate is first set against the surface and a pressure of about 16 lb. is applied against the point. The hardness number is read directly on the indicator.



with the Barcol Impressor

greatly. The measurements indicate that smaller diameters of the impression correspond to higher hardness. This fact can be visualized by noting Fig. 6 which is a photomicrograph of the tip of the penetrator. Table II summarizes measurements of the impressions shown in Figs. 3 to 5.

Further micrographic observations were made in an effort to determine the total depth of indentation. Table III indicates the results from tests made by means of the micrometer adjustment of a standard metallographical microscope. Careful analysis indicates that the well known "piling-up effect" of standard hardness tests, such as the Brinell, Rockwell or Diamond Pyramid tests, is also inherent to the Barcol. Table IV presents two examples to illustrate. This feature must be considered in evaluating the Barcol test for satisfactory industrial applications.

For all practical purposes it is important that the reading on the dial be "O" when the instrument is not in use as well as when measuring the hardness of very hard and ground steel surfaces. The latter "O" is actu-

Nothing has appeared in the technical literature heretofore discussing the useful range of application of the new Barcol hardness tester. Here, the author reports his experiences in testing the hardness of such varied materials as aluminum, aluminum alloys, brass, copper, steel and certain plastics with this quick, lightweight, shop instrument.

ally 100 Barcol hardness. The manufacturers advise that if either reading is not attained, the penetrator is worn or damaged and should be replaced—providing the initial adjustments were made correctly. It should further be realized that the impressor will give no indication (or "O readings") on soft wood, lead, tin, cadmium, solders, etc., nor will it be possible to differentiate the hardness of any hardened steel products.

Test Results with the Barcol

Although the instrument was originally designed for testing the hardness of aluminum, aluminum alloys, soft metals and plastics, it became desirable to make numerous tests in order to visualize the actual value of the instrument in the line of techni-

cal measurements. Brass and bronze, aluminum and its alloys gave constantly reproducible values which were in agreement with conversion tables published by the American Society for Testing Materials, General Motors, Wilson Instrument Co. and others. As already mentioned, very soft metals are in the "O" Barcol range, but tests with cadmium plated specimens of SAE 6145 test blocks hardened and drawn to 47 Rockwell C did indicate, however, that increased thickness of cadmium plate lowers the hardness in proportion with the thickness of the plating. Table V shows this relationship.

Tests with plastics invariably called for speed in making the initial reading after applying the load to the instrument. The well known plastic flow

• • •



FIG. 3—Photomicrograph of a Barcol impression on soft brass having a Rockwell hardness of B38 and a Barcol 83.



FIG. 4—Photomicrograph of a Barcol impression on hard brass having a Rockwell hardness of B83 and a Barcol 93.

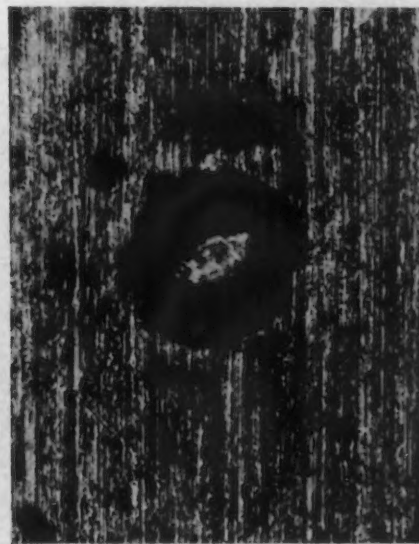


FIG. 5—Photomicrograph of a Barcol impression on soft steel; Brinell 124 and Barcol 94.

TABLE II

Material Tested	Diameter of Impression, mm.		
	Min.	Max.	Average
Brass (B-38)...	0.26	0.28	0.27
Brass (B-83)...	0.23	0.24	0.24
Steel (124 BHN)	0.23	0.23	0.23
Impressor Tip...	....	....	0.160

followed immediately, even during the very first second of loading. The importance of this observation may readily be ascertained by a series of timed readings taken on a ¼ in. lucite plate. The rapid drop in hardness is recorded in Table VI. Measurements made by recording initial hardness indicate quite a spread of Barcol hardness for some of the more common plastics; see Table VII. Additional surveys were made by applying the Barcol test to various standards of wood. No satisfactory readings were obtained with soft grades and most of the hard woods. However, differences between the dark and light strata of lignum vitae were noted. The light areas indicated 35 to 40 hardness whereas the dark and apparently denser winter growth rose to 40 to 46 Barcol.

The reported as well as additional tests were all made by using the writer's standard test blocks of care-

TABLE III

Material Tested	Barcol Hardness	Depth of Indentation, mm.
Aluminum.....	62	0.2988
Brass.....	83	0.1165
Steel.....	91	0.0522
Brass.....	93	0.0409
Stainless 18-8..	98	0.0192

TABLE IV

Type of Metal	Aluminum	Brass
Total depth of Indentation, mm....	0.3158	0.1211
Net depth of Indentation, mm....	0.2988	0.1165
Piling up, mm....	0.0170	0.0046
Piling up, per cent..	5.7	3.9

fully analyzed and tested materials. The sizes were all 2x1x½ in.

Conversion to Standard Scales

Practically all American industries express hardness in one or more standardized scales, such as Diamond Pyramid, Brinell, Rockwell or Shore numerals. In order to compare the Barcol test with the known methods of hardness testing, duplicate test series were made with the mentioned test blocks. The preliminary work indicated that the Barcol may find practical use especially in the lower hardness range. With this in mind only the Brinell hardness determined by a

TABLE V

Barcol Hardness Tests With Varying Thickness of Cadmium Plated on Steel

Thickness of Plate, in.	Average Barcol Hardness
0.0000	100.0
0.0015	97.5
0.0025	96.0
0.0030	95.0
0.0045	92.5

500 kg. load upon a 10 mm. steel ball were correlated. Table VIII shows some of the test results in tabular form. A diagram has been constructed from these measurements and is reproduced in Fig. 7. No attempt has been made to correlate the Barcol indentation test with those procedures based on rebound principles.

Conclusion

In summing up the many measurements and tests, it appears that the Barcol is primarily a quick and comparatively foolproof instrument of definite shop value. Its maximum dimensions (5½ in. long, ¾ in. high and 1 7/16 in. wide) together with its insignificant weight (339 grams or 0.778 lb.) enable operators to make extensive use of the instrument. The application for measuring the hardness of plastics requires definite manual dexterity. Inexperienced operators could obtain erroneous readings if no specific instruction is offered to them.

There is perhaps some interesting paradox connected with the introduction of the Barcol. The fundamentals of the Barcol impressor are by no

TABLE VI

Number of Seconds After Initial Load Application	Reading of Barcol
0	38
1	34
2	30
4	28
6	26
8	25
12	23
16	21
20	20
24	19

means of recent origin. F. C. Calvert and R. Johnson described this principle in a paper entitled "On the Hardness of Metals and Alloys" before the Literary and Philosophical Society of Manchester; 1857 session, which was published on pages 114 to 121, Vol. XVII, of the Philosophical Magazine in 1859. Reproduction of the apparatus is presented in Fig. 8.

The loading was accomplished by weights added to pan "C"; the weight necessary to produce a depth of penetration to 3.5 mm. into the tested

TABLE VII

	Barcol Hardness
Saran.....	30
Bakelite.....	63
Lucite.....	38
Phenolic, lamin., ¼ in....	68
Phenolic, lamin., ¾ in....	62

TABLE VIII

Barcol and Brinell Tests with Test Blocks of Various Materials

Material Tested	Barcol Hardness	Brinell Hardness (500 kg.)
Aluminum, rolled...	50	31.7
Aluminum, rolled...	54	34.8
Aluminum, rolled...	62	51.0
Copper, rolled.....	64	43.6
Aluminum Bronze, cast.....	67	58.6
Aluminum, rolled...	72	69.1
Copper, rolled.....	74	71.5
Aluminum, rolled...	79	86.0
Aluminum Bronze, rolled.....	88	92.6
Steel, rolled.....	93	123
Brass, rolled.....	93	120
Steel, Armco.....	94	126
Steel, SAE 1020....	95	133
Steel, SAE 1035....	97	160
Steel, Stainless 18-8	98	171
Steel, SAE 1045....	100	201



Fig. 6—The tip of the Barcol penetrator at 100 diameters.

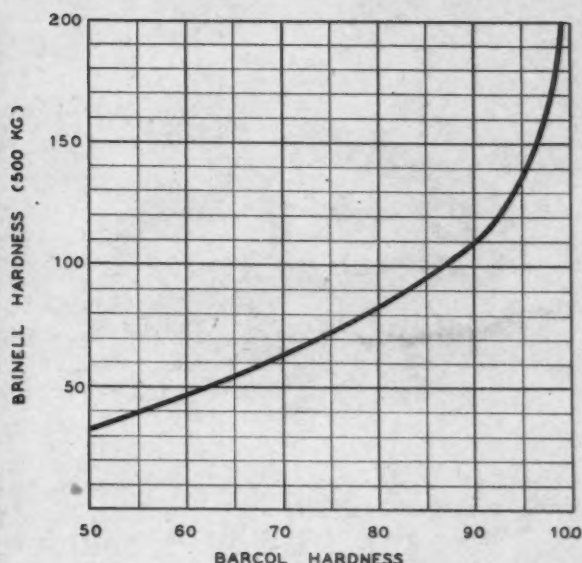


FIG. 7—Correlation between Barcol and Brinell hardness (500 kg. load, 10 mm. steel ball).

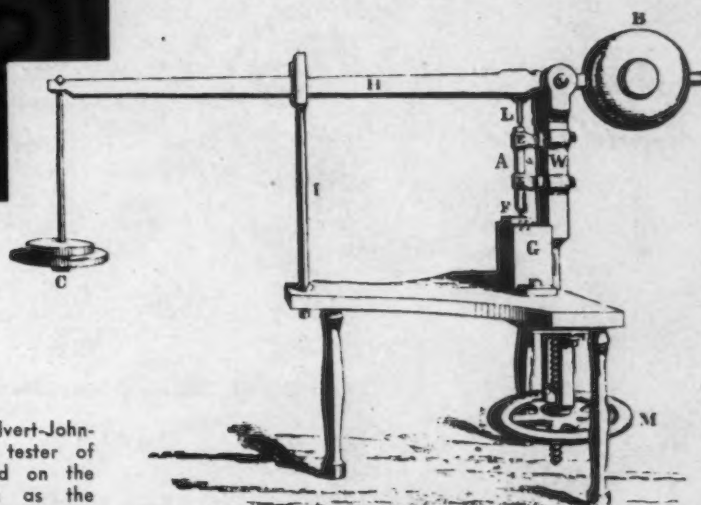


FIG. 8—The Calvert-Johnson hardness tester of 1857 was based on the same principles as the more recent Barcol Impressor test. A steel penetrator of 5 mm. diameter at one end and 1.25 mm. on the other plane of the truncated cone was used. Weights were added to pan C to penetrate 3.5 mm. into the test piece. The load necessary for this penetration was the hardness number.

specimen was the "hardness number." The penetrator was also steel as in the Barcol, but the diameter was 5 mm. at one end and 1.25 mm. on the other plane of the truncated cone 7 mm. long. This indicates an included angle of nearly 30 deg., which is very close to that of the Barcol impressor. There was, of course, a difference in expressing or measuring "hardness" by both procedures. While the Calvert-Johnson was of the first depth of penetration principle, the Barcol is based on a uniform load with indentation as a measured variable. There were no indicators available in the middle of the last century! Since its introduction 86 years ago, the Calvert-Johnson test found little, if any, adop-

tion as a universal hardness testing method.

The features of the Barcol are apparently novel and definitely usable. The originators of the Barcol did, however, introduce a new hardness scale which is based on a "number" which is actually about 6.4 microns

per unit. The calibration of the dial could have been expressed in the universal DPH or Brinell numerals. This would have avoided the unnecessary conversion and would have been more understandable in the parlance of modern metallurgy and testing engineers.



Special Addition A

AS part of a cooperative test program involving nine basic open hearth heats, Buick Motor Division, General Motors Corp., has made tests and compiled data, presented here, on the effect of varying

amounts of special addition agents in steel and comparative properties of a number of treated and untreated steels. Most of the commercial work on special addition agents for steel pre-

viously done by Buick has been on treated plain carbon and manganese steels with 0.20 to 0.50 C, and Mn in four ranges as follows: 0.70 to 1.00, 1.00 to 1.30, 1.35 to 1.65 and 1.60 to 1.90. A recent application of more than usual interest has been a long torsion bar 2 in. diameter made of treated NE 9262 steel. This material was adopted after a number of other untreated steels were tried without success. Comparing the treated carbon and

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TABLE I
Currently Available Special Addition Agents

Alloy Designation	Al	B	Ca	Mn	Si	Ti	Zr	Fe
1	7.0	0.5	10.0	....	35.0 to 40.0	10.0	4.0	Bal.
2	....	10.0 to 12.0	....	....	3.0	....	....	Bal.
3	10.0 to 20.0	1.0 to 2.0	....	15.0 to 25.0	20.0 to 30.0	10.0 to 20.0	....	Bal.
4	13.0	0.5	....	8.0	....	20.0	4.0	Bal.
5	....	1.0 to 6.0	....	....	40.0 to 45.0	....	....	Bal.

TABLE II
Hardenability of 0.20 Carbon Steels Treated and Untreated

Item No.	Spec. No.	*T or U	No. of Heats	C	Mn	Si	Ni	Cr	Mo	Grain Size	Hardenability (J-40)	D (Oil)
1	SAE 4320	U	8	0.20	0.55	....	1.82	0.52	0.23	7.4	4.1	3/4
2	SAE 4820	U	10	0.21	0.54	....	3.57	....	0.22	6.8	5.5	1
3	NE 8720	U	8	0.22	0.81	0.22	0.56	0.49	0.23	8.0	3.4	5/8
4	NE 9420	U	1	0.21	0.99	0.48	0.48	0.35	0.12	8.0	2.7	1/2
5	NE 9420	T	1	0.20	0.98	0.57	0.47	0.35	0.12	8.0	9.6	1 3/4
6	Y-1320	U	1	0.25	1.53	....	....	....	....	7.5	2.8	1/2
7	Y-1320	T	1	0.26	1.53	....	....	....	....	7.5	9.3	1 3/4

* T or U indicates treated or untreated.
Values for Items 1, 2 and 3 are averages of 8, 10 and 8 heats respectively.
Items 4 and 5 are from Fig. 10, treated in ingot mold.
Items 6 and 7 are from Fig. 1, treated in ingot mold.
All heats are basic open hearth.

TABLE III
Hardenability of 0.40 Carbon Steels Treated and Untreated

Item No.	Spec. No.	*T or U	No. of Heats	C	Mn	Si	Ni	Cr	Mo	Grain Size	Hardenability (J-50)	D (Oil)
1	SAE 3140	U	10	0.41	0.82	....	1.20	0.66	....	8.0	8.0	1 3/8
2	SAE 4140	U	10	0.40	0.80	....	....	0.97	0.18	7.2	11.9	2 1/8
3	NE 9440	T	1	0.40	1.06	0.53	0.44	0.30	0.12	8.0	24.0	4
4	GM 1340-A	U	1	0.40	1.69	....	....	....	....	7.5	6.5	1 1/8
5	GM 1340-A	T	1	0.41	1.75	....	....	....	....	7.0	27.1	4+
6	Y-1340	U	1	0.45	1.52	....	....	....	....	8.0	3.4	5/8
7	Y-1340	T	1	0.43	1.49	....	....	....	....	7.5	13.5	2 3/8

* T or U indicates treated or untreated.
Values for Items 1 and 2 are averages of 10 heats each.
Item 3 was treated in the ingot mold.
Items 4 and 5 are from Figs. 3A and 3B (Ingots A and C), treated in ingot mold.
Items 6 and 7 are from Fig. 2, treated in ingot mold.
All heats are basic open hearth.

Fig. 1—
Specific
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Addition—
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Agent Steels . . .

By R. B. SCHENCK
Chief Metallurgist, Buick Motor Division
General Motors Corp.

manganese steels mentioned above with untreated steels of the same composition, the only noteworthy

Other articles on intensifying and addition agents appeared in THE IRON AGE issues of Nov. 19, 1942; Feb. 4, March 25, July 1 and Aug. 19, 1943.

difference found in the shop was the improved machinability of the treated higher manganese types. In comparing the treated 1.00 to 1.30 manganese series with the untreated 1.60

Extensive data on recent laboratory tests of steels treated and untreated with varying amounts of special addition agents are presented here, together with some general conclusions and observations on the uses of treated steels.

to 1.90 manganese steels for which the former were substituted in a number of applications, the difference in machinability in favor of the treated steels was still more pronounced. As one member of the organization remarked, "These steels (treated 1.00

to 1.30 manganese) anneal and machine like carbon steels and heat treat like alloy steels."

The forging qualities of the treated steels appeared to be as good as those of the same compositions untreated. The same was true of annealing. The

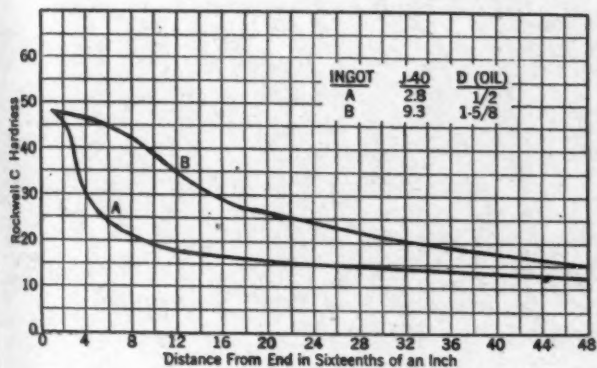


Fig. 1—Test results on bars from treated and untreated ingots from a heat of Y-1320

Specification—C 0.15 to 0.25, Mn 1.35 to 1.65 (Y-1320).
Melting Process—Basic open hearth.
Addition Agent—Mold additions as indicated.
Heat Treatment (all temperatures deg. F.).
Tensile Bars—Annealed 1650—Oil quenched 1600 (0.520 diameter)—Drawn 450.
Izod Bars—Annealed 1650—Oil quenched 1600 (0.470 diameter)—Drawn 450.
Hardenability Bars—Annealed 1650—Quenched 1600.

Chemical Composition and Mechanical Properties		
Ingot Designation	A	B
Addition—lb. per gross ton	0	4
Grain Size	7½	7½
Carbon	0.25	0.26
Manganese	1.53	1.53
Yield Point	104300	206300
Tensile Strength	119900	215600
Elongation—2 in.	19.3	13.8
Red. of Area	60.70	56.60
P Value	96.82	111.04
Izod Value	82.3	45.1

Although the specified carbon ranges are different, the samples tested conform to SAE 1024. The effect of the addition agent is very pronounced with respect to both hardenability and mechanical properties. It should be noted that the untreated sample is only partially hardened. The J-40 and the corresponding D size show that it is on the borderline where it can go either way. Referring to Table II, the treated sample exhibits a much higher J-40 hardenability than SAE 4320, SAE 4820 and NE 8720, and about the same J-40 as the treated NE 9420. Comparing Y-1320 and NE 9420, both treated and untreated, it is seen that the two steels parallel each other quite closely. The difference in carbon content must, of course, be taken into consideration.

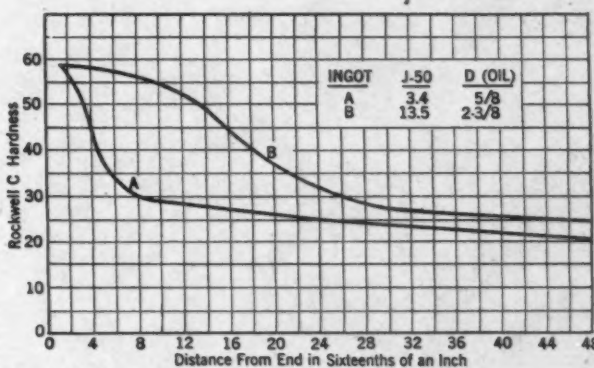


Fig. 2—Test results on bars from treated and untreated ingots from a heat of Y-1340

Specification—C 0.38 to 0.43, Mn 1.35 to 1.65 (Y-1340).
Melting Process—Basic open hearth.
Addition Agent—Mold additions as indicated.
Heat Treatment—(all temperatures deg. F.).
Tensile Bars—Annealed 1600—Oil quenched 1550 (0.520 diameter)—Drawn 450.
Izod Bars—Annealed 1600—Oil quenched 1550 (0.470 diameter)—Drawn 450.
Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties		
Ingot Designation	A	B
Addition—lb. per gross ton	0	4
Grain Size	8	7½
Carbon	0.45	0.43
Manganese	1.52	1.49
Yield Point	237000	242000
Tensile Strength	269600	282800
Elongation—2 in.	5.0	11.0
Red. of Area	18.85	41.20
P Value	76.54	106.00
Izod Value	2.7	10.3

Except for the specified carbon range, this steel is a low sulphur variant of SAE 1141. In addition to a very marked improvement in hardenability and mechanical properties due to the addition agent, the treated sample has a higher J-50 hardenability than either SAE 3140 or 4140 as shown in Table III.

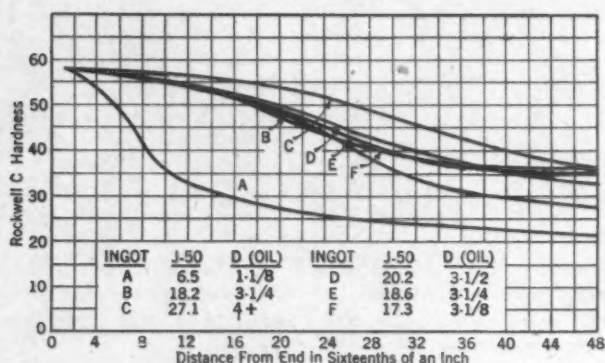


Fig. 3A—Test results on bars from treated and untreated ingots from a heat of GM 1340-A, drawn at 450 deg. See Fig. 3B for test results on bars from the same ingots drawn at 900 deg.

Specification—GM 1340-A.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment—(all temperatures deg. F.).

Tensile Bars—Annealed 1600—Oil quenched 1550 (0.520 diameter)—Drawn 450.

Izod Bars—Annealed 1600—Oil quenched 1550 (0.470 diameter)—Drawn 450.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B	C	D	E	F
Addition—						
lb. per gross ton...	0	2	4	6	8	10
Grain Size	7 1/2	6	7	8	8	8
Carbon	0.40	0.42	0.41	0.41	0.41	0.41
Manganese	1.69	1.73	1.75	1.72	1.72	1.67
Yield Point	237600	251100	247900	251350	250700	247900
Tensile Strength	251100	269000	269400	271900	272000	267600
Elongation—2 in.	9.8	12.0	13.5	12.0	13.0	12.8
Red. of Area	33.98	41.90	51.08	47.40	48.25	49.13
P Value	91.00	104.08	115.18	111.26	112.30	112.48
Izod Value	5.5	14.8	21.8	17.8	20.8	22.0

This series of tests was made to determine the optimum amount of additive to be used. The quantity of this particular addition agent usually recommended for basic open hearth steel is 4 lb. per gross ton. The results indicate that this quantity is the one most effective for this heat of steel. The J-50 hardenability increases progressively with increasing amounts up to 4 lb. and then decreases; at 10 lb. it has fallen to less than the value for 2 lb. The improvement in mechanical properties starting with the 2-lb. addition is very pronounced. Referring to Table III, the treated GM 1340-A has a slightly higher J-50 than the treated NE 9440 and a very much higher J-50 than either SAE 3140 or 4140. The 2-lb. addition also has a higher J-50 than the latter two steels. The mechanical properties for the 4, 6, 8 and 10-lb. additions show very little difference.

GM 1340-A type, treated and untreated, responded equally well to the same annealing cycle. The treated lower manganese steels annealed more readily than the untreated higher manganese series.

No standard specifications now exist for special addition agent steels. It is obvious that chemistry alone will not suffice, and that hardenability and possibly mechanical properties must be specified in addition to chemistry. Tentative specifications including these three requirements have been formulated and are now receiving serious consideration.

Buick's work with addition agents indicates that the improvement in mechanical properties from the additive treatment is confined mostly to the carbon and low alloy steels, and

is most pronounced at draw temperatures of 300 to 500 deg. F.

In general, it may be stated that, with respect to hardenability and mechanical properties, a carbon steel can be made equivalent to a low alloy steel and a low alloy steel equivalent to a high alloy steel by additive treatment.

The addition agents may be added either in the ladle or ingot mold, preferably in the ladle. Ingot mold additions greatly facilitate experimental work.

The amount of additive required varies, depending upon the type of additive, the composition of the steel and the degree of deoxidation. Uniform melting practice is essential to good results.

If increasing additions of a given

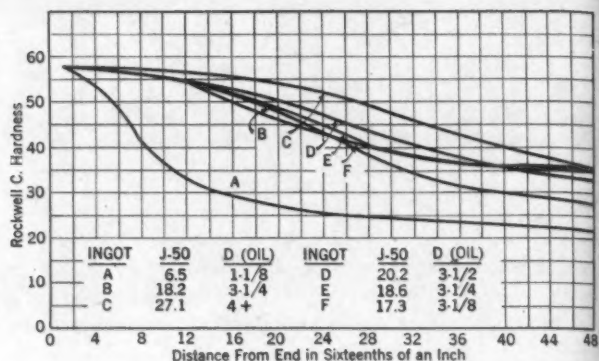


Fig. 3B—Test results on bars from treated and untreated ingots from a heat of GM 1340-A, drawn at 900 deg. See Fig. 3A for test results on bars from the same ingots drawn at 450 deg.

Specification—GM 1340-A.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment—(all temperatures deg. F.).

Tensile and Izod Bars—Oil quenched 1600 (1 1/16 diameter)—Drawn 900.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B	C	D	E	F
Addition—						
lb. per gross ton...	0	2	4	6	8	10
Grain Size	7 1/2	6	7	8	8	8
Carbon	0.40	0.42	0.41	0.41	0.41	0.41
Manganese	1.69	1.73	1.75	1.72	1.72	1.67
Yield Point	123600	156300	161500	163100	170700	171800
Tensile Strength	142900	166600	169400	171900	175900	177300
Elongation—2 in.	16.5	15.5	16.0	15.5	15.0	14.8
Red. of Area	57.38	54.33	54.63	53.80	52.88	53.83
P Value	97.44	98.52	99.44	98.94	98.64	100.06
Izod Value	72.7	52.8	48.6	40.7	38.5	38.3

This is the same series as in Fig. 3A quenched in 1 1/16 diameter and drawn at 900 deg. F. There is a progressive increase in yield point and tensile strength and a progressive decrease in Izod value with increasing amounts of additive at this draw temperature. The P values are but little different in all six samples. The untreated ingot is close to the borderline in hardenability for this section and shows evidence of incomplete hardening. The lower order of P values with the 900 deg. F. draw compared with the 450 deg. F. draw is characteristic of high hardenability steels.

type of additive are made to different ingot molds of the same heat, the hardenability will be found to increase with the amount of additive up to a maximum or optimum value, and then decrease with further increases of additive. Maximum mechanical properties usually coincide with maximum hardenability. Additions greater than the optimum tend to lower the mechanical properties.

In spite of the exacting requirements to be met in melting treated steels, a number of mills have demonstrated their ability to melt heat after heat with as good uniformity as untreated steels. This has been borne out by Buick's experience and that of other users with a large number

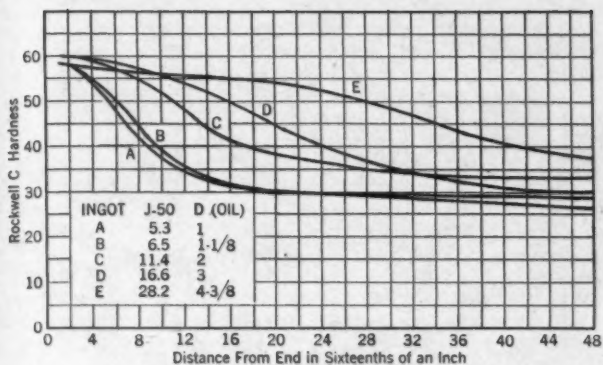


Fig. 4—Test results on bars from treated and untreated ingots from a heat of GM 1340-A

Specification—GM 1340-A.

Melting Process—Basic open hearth.

Addition Agent—Mold addition as indicated.

Heat Treatment—(all temperatures deg. F.).

Tensile Bars—Annealed 1600—Oil quenched (0.520 diameter) 1550—Drawn 450.

Izod Bars—Annealed 1600—Oil quenched (0.470 diameter) 1550—Drawn 450.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B	C	D	E
Addition—lb. per gross ton	0	1	2	3	4
Grain Size	7	7 1/2	8	8	7 1/2
Carbon	0.43	0.44	0.44	0.43	0.43
Manganese	1.74	1.76	1.71	1.71	1.71
Yield Point	247300	248300	247000	244500	242400
Tensile Strength	270200	273500	273100	274900	279800
Elongation—2 in.	10.5	11.5	12.3	12.7	12.7
Red. of Area	34.45	38.90	40.90	46.70	43.60
P Value	95.38	101.38	103.70	111.02	108.28
Izod Value	3.7	2.7	4.5	8.3	14.3

These tests were made to determine the effect of small amounts of additive. This heat and the one reported in Fig. 3 (A and B) were from different sources. The J-50 hardenability shows a progressive increase with increasing amounts of additive. The improvement in mechanical properties follows the usual trend, but with a somewhat lower order of P and Izod values than the previous heat.

TABLE IV
Pseudocarburing Tests on NE 8720
Untreated and NE 9420 Treated

Specification	NE 8720	NE 9420
No. of Heats	8	1
Grain Size	8	7
Hardenability (J-40)	3.4	6.4
D (Oil)	5/8	1 1/8
Carbon	0.22	0.20
Manganese	0.81	0.89
Silicon	0.22	*0.22
Nickel	0.56	0.29
Chromium	0.49	0.33
Molybdenum	0.23	0.13
Yield Point	165700	167500
Tensile Strength	194500	188300
Elongation—2"	12.5	14.8
Red. of Area	47.83	61.3
P Value	96.30	111.22

* This is the modified type of 9420 with silicon 0.20 to 0.35.

All heats are basic open hearth. Values for NE 8720 are averages of 8 heats.

NE 9420 treated with ladle addition.

Heat treatment (all temperatures deg. F.).

Tensile Bars—Annealed 1700—Pseudocarbured in pitch coke at 1700 for 8 1/2 hr. and oil quenched from box (0.520 dia.)—drawn 300.

Hardenability Bars—Annealed 1650—Quenched 1600.

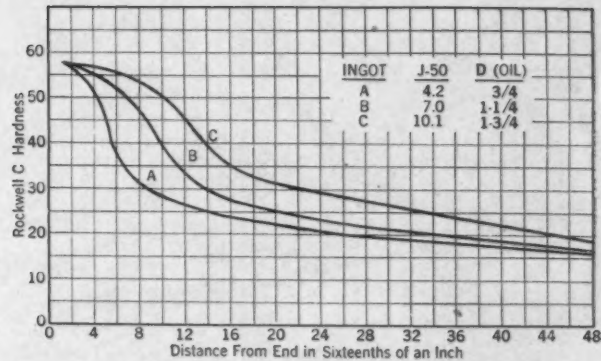


Fig. 5A—Test results on bars from treated and untreated ingots from a heat of GM 5040-A, drawn at 450 deg. See Fig. 5B for test results on bars from the same ingots drawn at 900 deg.

Specification—GM 5040-A.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment—(all temperatures deg. F.).

Tensile Bars—Annealed 1600—Oil quenched 1550 (0.520 diameter)—Drawn 450.

Izod Bars—Annealed 1600—Oil quenched 1550 (0.470 diameter)—Drawn 450.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B	C
Addition—lb. per gross ton	0	2	4
Grain Size	7	7	7
Carbon	0.41	0.42	0.42
Manganese	0.92	0.90	0.88
Chromium	0.58	0.57	0.58
Yield Point	247400	249000	250000
Tensile Strength	261400	273700	281500
Elongation—2 in.	6.7	8.5	12.5
Red. of Area	23.95	26.30	48.55
P value	81.02	86.30	114.56
Izod value	7.5	11.5	14.7

This steel shows excellent response to the addition agent both in hardenability and mechanical properties.

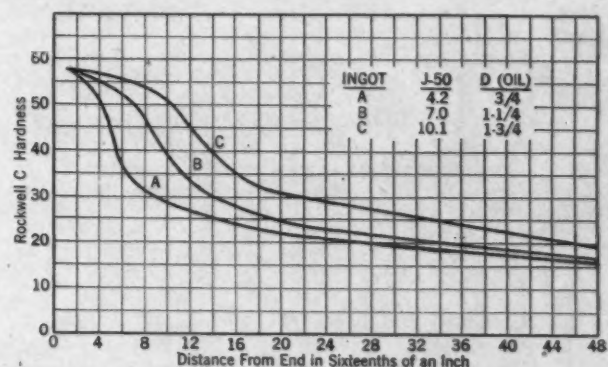


Fig. 5B—Test results on bars from treated and untreated ingots from a heat of GM 5040-A, drawn at 900 deg. See Fig. 5A for test results on bars from the same ingots drawn at 450 deg.

Specification—GM 5040-A.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment—(all temperatures deg. F.).

Tensile Bars—Oil quenched 1600 (1 1/16 diameter)—Drawn 900.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B	C
Addition—lb. per gross ton	0	2	4
Grain Size	7	7	7
Carbon	0.41	0.42	0.42
Manganese	0.92	0.90	0.88
Chromium	0.58	0.57	0.58
Yield Point	106100	142600	168700
Tensile Strength	132400	155600	176400
Elongation—2 in.	19.7	14.7	15.0
Red. of Area	60.05	57.55	57.27
P Value	98.54	100.18	104.00

This is the same series as in Fig. 5A quenched in 1 1/16 inch diameter and drawn at 900 deg. F. The response to the additive follows the usual trend. The untreated sample is only partially hardened.

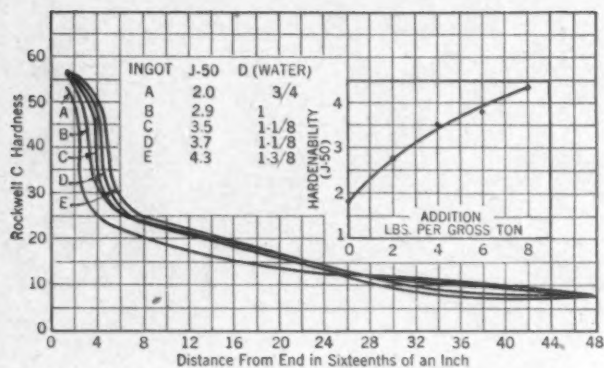


Fig. 6—Test results on bars from treated and untreated ingots from a heat of SAE 1040

Specification—SAE 1040.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Tensile and Izod Bars—Water quenched 1600 (1 1/16 diameter)—Drawn 900.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	6	A	B	C	D	E
Addition—Lb. per gross ton	0	2	4	6	8	
Grain Size	7	7	7	7 1/2	7	
Carbon	0.38	0.41	0.42	0.41	0.40	
Manganese	0.75	0.75	0.75	0.75	0.76	
Chromium	0.09	0.09	0.08	0.08	0.08	
Yield Point	91100	107700	126500	136600	139700	
Tensile Strength	118000	134000	143250	147200	148900	
Elongation—2 in.	22.8	20.5	16.5	17.5	18.3	
Red. of Area	57.53	62.40	55.95	57.90	60.33	
P Value	92.64	101.68	95.79	98.92	102.18	
Izod Value	75.8	36.8	58.5	58.3	53.8	

This is another series of tests made to determine the optimum amount of addition agent required. Due to the low hardenability of the base material the tests were confined to water quenched 1 1/16 diameter bars drawn at 900 deg. F. As indicated by the J-50 values and confirmed by the tensile and Izod tests, the untreated sample and the one with the 2-lb. addition are only partially hardened. The low Izod resulting from the 2-lb. addition is probably associated with a critical degree of partial hardening which has been found to occur in some low hardenability steels. Starting with the 4-lb. addition, the mechanical properties are characteristic of treated steels of this type. The curve in the small box is added to show the J-50 hardenability plotted against the amount of addition agent.

of heats including a number of different compositions.

The recent tests made in Buick laboratories are reported in Figs. 1 to 11. Results in each case represent treated and untreated ingots from the same heat of steel. Table I gives compositions of a number of currently available special addition agents. Comparative hardenability for a number of treated and untreated steels are shown in Tables II, III and IV.

The same addition agent was used in the treated ingots reported in Figs. 1 to 5 inclusive. This was a type containing vanadium and is not listed in Table I. Another type of additive not containing vanadium and not appearing in Table I was used in the treated ingots reported in Figs. 6 and 7. Alloy No. 4 was the additive in the treated ingots of Figs. 8

and 9 and in NE 9440, Item 3, Table III, and NE 9420, Table IV. Alloy No. 1 was used in the treated ingots of Figs. 10 and 11.

Wherever possible bars or billets from middle cuts were used. In comparing treated and untreated ingots from the same heat, samples were taken from the same location in the ingots, preferably from middle cuts. Each set of tests, including chemistry and grain size, represents a single bar or

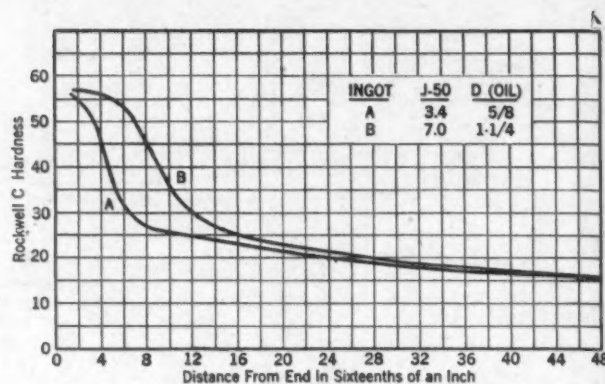


Fig. 7—Test results on bars from treated and untreated ingots from a heat containing C 0.38 to 0.43, Mn 1.00 to 1.30

Specification—C 0.38 to 0.43 Mn 1.00 to 1.30

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Tensile and Izod Bars—Oil quenched 1600—(1 1/16 diameter)—Drawn 900.

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition and Mechanical Properties

Ingot Designation	A	B
Addition—Lb. per gross ton	0	4
Grain Size	7	7
Carbon	0.41	0.40
Manganese	1.15	1.17
Nickel	0.10	0.10
Chromium	0.18	0.16
Yield Point	94900	147100
Tensile Strength	124300	159500
Elongation—2 in.	20.8	16.5
Red. of Area	59.65	55.90
P Value	96.44	98.98
Izod Value	64.8	63.7

This composition does not conform to any SAE or AISI specification. With an additive treatment it is known as Buick 1341-A. It responds well to the addition agent and shows excellent mechanical properties. This steel with addition agent treatment has been used in a number of high duty automotive parts.

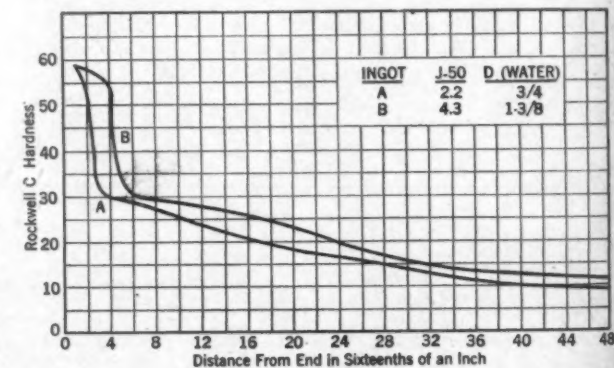


Fig. 8—Test results on bars from treated and untreated ingots from a heat of SAE 1045

Specification—SAE 1045.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Hardenability Bars—Annealed 1700—Quenched 1550.

Chemical Composition

Ingot Designation	A	B
Addition—Lb. per gross ton	0	4
Grain Size	8	8
Carbon	0.47	0.47
Manganese	0.77	0.78
Silicon	0.18	0.18
Nickel	0.05	0.06
Chromium	0.03	0.04
Molybdenum	Nil	Nil

These results show the effect on the J-50 hardenability of 4-lb. addition to SAE 1045 and may be considered typical.

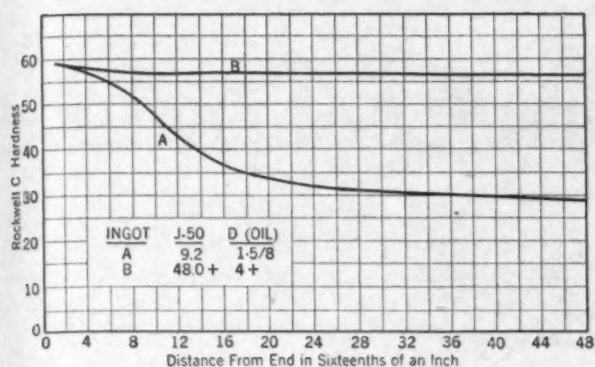


Fig. 9—Test results on bars from treated and untreated ingots from a heat of NE 8442

Specification—NE 8442.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Hardenability Bars—Annealed 1600—Quenched 1550.

Chemical Composition

Ingot Designation	A	B
Addition—Lb. per gross ton	0	4
Grain Size	8	8
Carbon	0.45	0.45
Manganese	1.45	1.45
Silicon	0.32	0.33
Nickel	0.12	0.16
Chromium	0.06	0.07
Molybdenum	0.28	0.27

Although this steel has been deleted from the NE list, it was felt that the results were of sufficient interest to justify their inclusion. A comparison with the steel in Fig. 2 gives some idea of the effect of an addition agent treatment versus 0.28 molybdenum and the combined effect of the two.

billet. No ladle analyses are reported. Sizes were 1 1/4 in. rd. or over.

Samples were hand forged at 2350 deg. F. to 1 1/4 in. rd. for the hardenability bars and to 1 1/16 in. rd. for the tensile and Izod bars. After forging, samples were annealed at temperatures indicated and cooled in mica. Total time in the furnace was one hr.

Tensile and Izod bars to be drawn at 450 deg. F. were machined to 0.520 in. in diameter and 0.470 in. in diameter before quenching, and ground to 0.505 in. in diameter and 0.450 in. in diameter respectively, after drawing. Tensile and Izod bars to be drawn at 900 deg. F. were quenched in the forged size of 1 1/16 in. in diameter. After drawing, standard 0.505 in. in diameter and 0.450 in. in diameter bars were machined and ground for testing. Tensile results are the average of two test bars and Izod results are the average of three notches on one test bar. Total heating time in the furnace was one hr. for quenching and two hr. for drawing. Quenching was done in still oil at 100 to 120 deg. F. and still water at 70 to 90 deg. F. temperatures.

Hardenability bars were quenched

at temperatures indicated according to standard procedure. Total heating time in the furnace was one hr.

In a number of instances the residual elements were not recorded for either the treated or untreated samples. Where direct comparisons are made between treated and untreated ingots from the same heat, the effect of residuals is cancelled out. However, it leaves some element of doubt when comparing steels from different heats. Judging from the history of the heats in question and the hardenabilities obtained on the untreated samples, it is believed the residuals have a very minor influence.

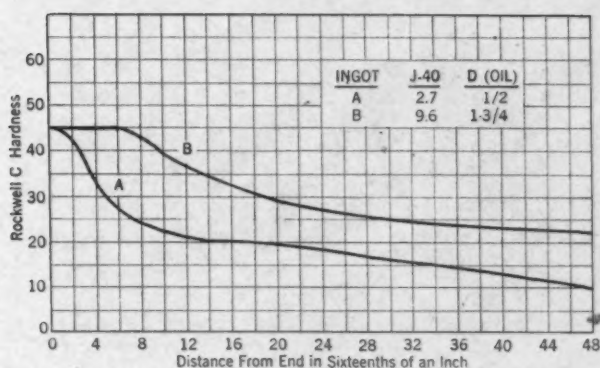


Fig. 10—Test results on bars from treated and untreated ingots from a heat of NE 9420

Specification—NE 9420.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Hardenability Bars—Annealed 1700—Quenched 1700.

Chemical Composition

Ingot Designation	A	B
Addition—Lb. per gross ton	0	4
Grain Size	8	8
Carbon	0.21	0.20
Manganese	0.99	0.98
Silicon	0.48	0.57
Nickel	0.48	0.47
Chromium	0.35	0.35
Molybdenum	0.12	0.12

These results show the excellent response of this steel to an additive treatment. Referring to Table II the treated sample has a much higher J-40 than SAE 4320, SAE 4820 and NE 8720. As previously stated in discussing Fig. 1, NE 9420 and Y-1320, treated and untreated, are very similar in behavior. For the same carbon content the NE 9420 would have a somewhat higher hardenability.

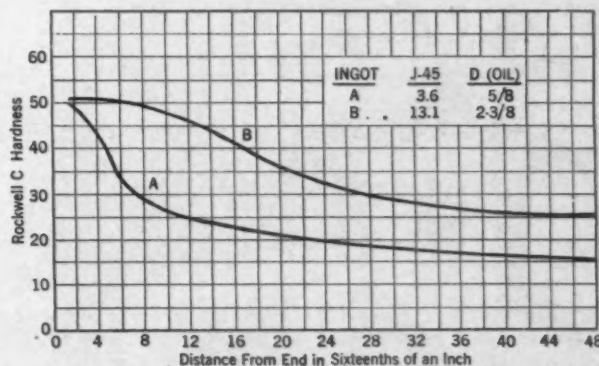


Fig. 11—Test results on bars from treated and untreated ingots from a heat of NE 9430

Specification—NE 9430.

Melting Process—Basic open hearth.

Addition Agent—Mold additions as indicated.

Heat Treatment (all temperatures deg. F.).

Hardenability Bars—Annealed 1700—Quenched 1600.

Chemical Composition

Ingot Designation	A	B
Addition—Lb. per gross ton	0	4
Grain Size	8	8
Carbon	0.33	0.33
Manganese	1.02	1.03
Silicon	0.48	0.57
Nickel	0.50	0.49
Chromium	0.26	0.25
Molybdenum	0.12	0.12

The response of this steel to the additive treatment is consistent with that of NE 9420.



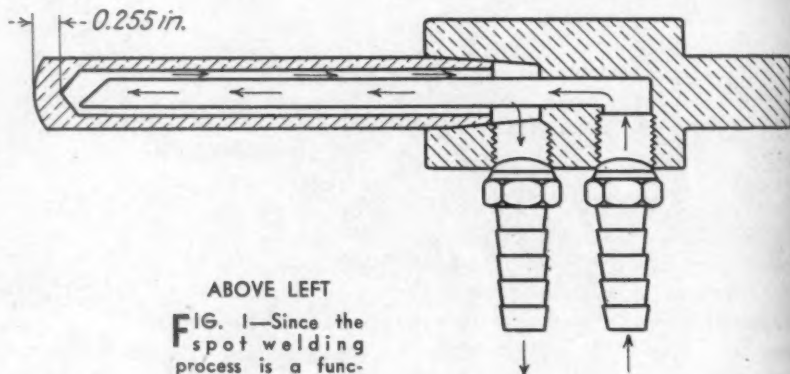
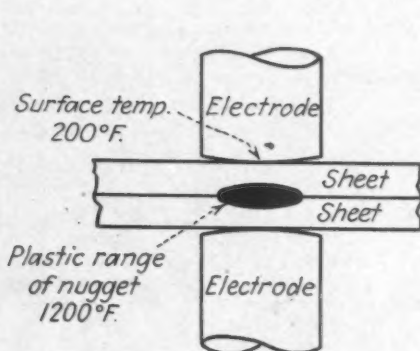
Super-Cooled

By CHARLES C. TITHERINGTON
Welding Engineer, Eastern Aircraft Division, General Motors Corp.

WHEN the demands of the National Defense Program first started the remarkable expansion of spot welding in the aircraft industry, there was only one machine—a reactor type—that would make a spot weld possessing any degree of quality. In its early stages, not even this machine was capable of sustained production speeds. However, manufacturers attacked the problem so successfully that at the end of a year there were on the market several types of machines which

were able to do quality work and still stand the “gaff” on the production line. Increased demands and length of time necessary to acquire spot welding equipment made it imperative to step up the performance of these machines above the normal 20 to 30 per cent efficiency. Frequent necessity of cleaning electrodes, caused by alloying the copper with aluminum, was the greatest single cause of this poor efficiency factor. This was traced to one major source.

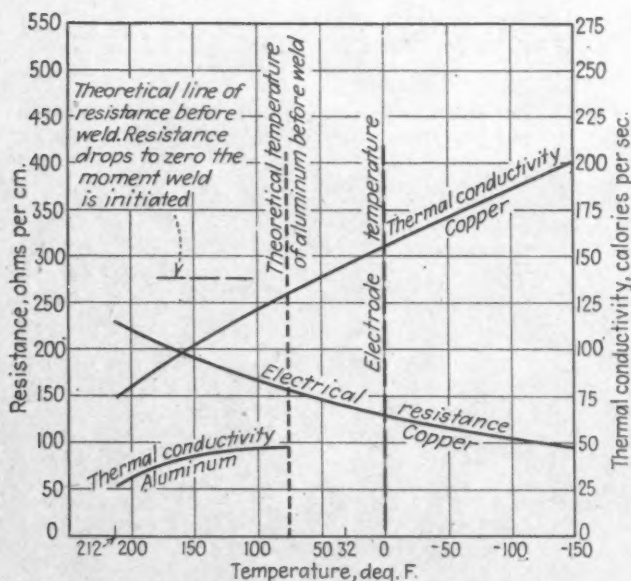
The spot welding process is a function of electrical resistance, and the passage of current between the faying (contacting) surfaces raises the temperature of aluminum to its fusion point. Since the electrical and thermal characteristics of the two metals are so closely related, a considerable amount of this resistance is developed at the surface of the sheet where electrode contact is made. (Fig. 1.) Without proper cooling, the amount of resistance will be sufficient to raise the surface temperature



ABOVE LEFT
FIG. 1—Since the spot welding process is a function of electrical resistance, with uncooled electrodes the temperature at the surface of the sheets may rise as high as 200 deg. F.

ABOVE
FIG. 3—Standard copper alloy electrode, 5/8 in. in diameter, used in the tests described in the article.

LEFT
FIG. 2—Changes in electrical resistance and thermal conductivity of aluminum and copper with changes in temperature. Conductivity is enhanced and resistance lowered as the temperature drops.



above 200 deg. F., which is very nearly one-sixth the internal fusion temperature of the weld itself. This elevated temperature causes the aluminum to alloy with the copper, a process which again raises the surface resistance. As a result, welds are burned and holes actually blown in sheets. The introduction of chemical cleaning decidedly improved conditions because such cleaning removed most of the oxide films that form on the surface of the sheet to be welded. Removal of the films cut down the surface resistance of the sheet to be welded and this action in turn reduced the surface heating. The first real steps in eliminating electrode pickup, however, were not

Spot Welding Electrodes

taken until the latter part of 1941 when a refrigerating unit was placed on the market by Frostrode Products, Detroit. This unit is a refrigerator whose prime function it is to cool the points of electrodes to such a degree that the heat generated during the welding operation will be transferred away from the surface of the work so rapidly that the aluminum will not alloy with the copper.

Theoretically, this action of keeping electrodes cool—or even at room temperature—during the welding operation should solve the problem of pickup since it is a known fact that a machine can go through the pressure cycle without the application of

... Tests made at Eastern Aircraft indicate that tremendous production increases in spot welding of aluminum and aluminum alloys can be obtained through the use of refrigeration, particularly when the electrodes used are specifically designed for use with refrigeration. The basic performance tests described herein also reveal that, at least in test runs, up to 5000 spot welds can be made without dressing electrodes, when ordinary methods of sheet cleaning are employed.

mal conductivity and the allied electrical conductivity of the two metals. Examination of Fig. 2 shows that, as the electrode temperature is lowered, there is a rapid increase in the thermal conductivity of the electrode to carry heat away from the weld surface and also in electrical conductivity,

resulting in lowering the tip-to-sheet contact resistance directly over the weld. From this information it can probably be assumed that at the lowest possible temperature—i. e., Absolute Zero—the best welding conditions would be attained. However, the cost of holding a temperature lower than 0 deg. F. sets this as a practical limit from a production standpoint. It is obvious from Fig. 2 that any decrease in temperature will increase the efficiency of the welding process.

The hoped-for result did not always materialize however since the coolant—depending on the operation—was unable to carry away the momentarily high heat generated when the

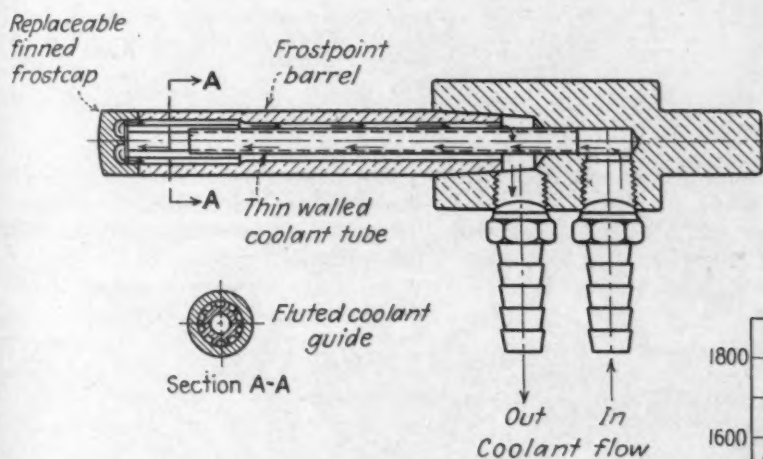


FIG. 4 — Replaceable Frostpoint finned cap with special deflector tube and point adapter assembly. The cap is forged cold with integral fins from electrolytic copper.

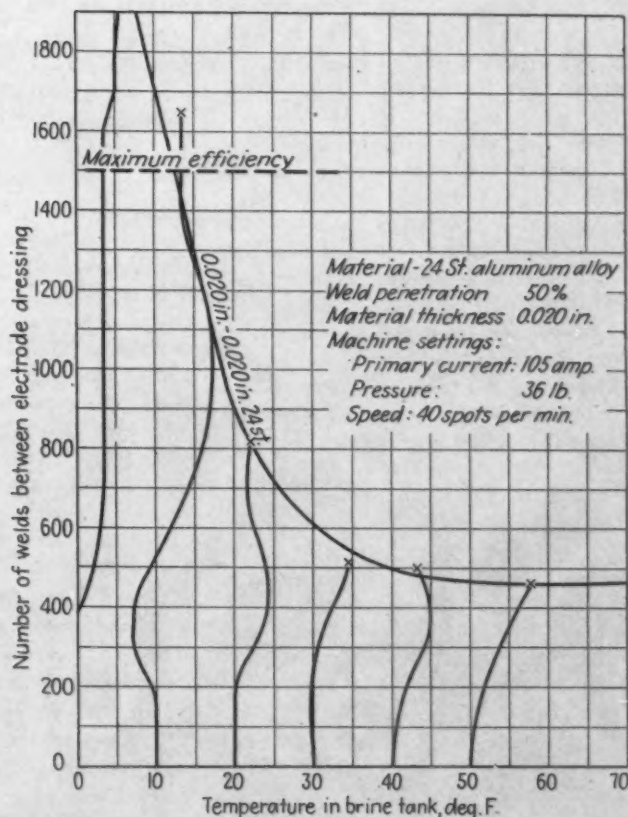
welding heat for an indefinite period of time and not show any signs of alloying on the tips.

What Cooling Does

The first and most important action which takes place during the refrigeration welding operation is a metallurgical one which tends to prevent the copper alloy electrode from alloying with the aluminum sheet. As the temperature is reduced, this alloying tendency is considerably reduced, provided the welder is so set up that the skidding action of the electrodes is held to a minimum. In fact, the lower the temperature of the copper electrode, the less chance there is of an aluminum-copper alloy forming.

The second function of cooling is the change it effects in both the ther-

FIG. 5 — Welds made between electrode dressings vs. temperature in brine tank of refrigerator when spot welding 0.020 in. 24ST aluminum alloy. Standard electrodes.



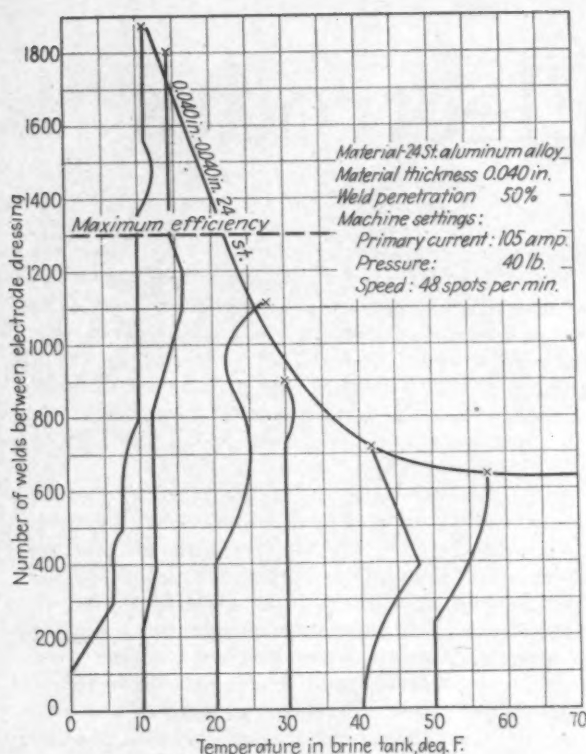


FIG. 6—Welds made between electrode dressings vs. tip coolant temperature when spot welding 0.040 in. 24ST aluminum alloy. Standard electrodes.

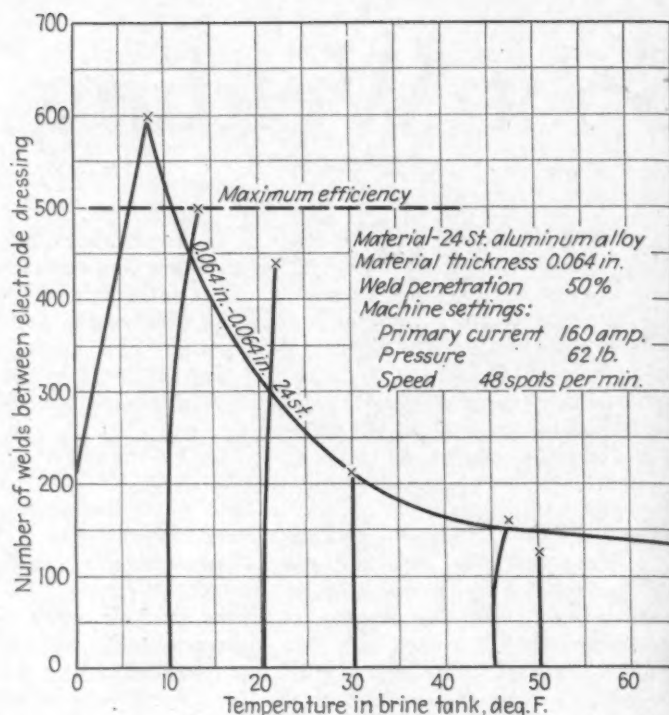


FIG. 7—Welds made between electrode dressings vs. tip coolant temperature when spot welding 0.064 in. 24ST aluminum alloy. Standard electrodes.

spots were made. Further research indicated that while the coolant remained at a level of 10 deg. F., the surface temperature of the electrode may climb to an extreme of 165 deg. F. Inasmuch as the refrigeration unit was of sufficient capacity and the temperature rise of the refrigerant was not abnormal, it was apparent that the solution lay in a redesign of the electrode. With the objective of greater heat transfer in mind, Frostrade Products designed the "Frostpoint" electrode which was used in part of this investigation.

The tests to determine the performance expectancy of this type equipment consisted of two series. In the first group of tests the machine was refrigerated but standard electrodes, Fig. 3, were used. In the second series the upper standard electrode was replaced by the new Frostpoint as shown in Fig. 4.

All tests described here were made on a standard 50-kva. reactor type machine, which had been converted for use with refrigeration. Its pre-heat and postheat, combined with the welding cycle, produced a far greater increase in temperature at the electrode surface than does any other type of equipment. This condition permits a greater differential to be shown in the results.

Special electrode holders coupled

with a standard $\frac{5}{8}$ in. diameter electrode; as shown in Fig. 3, were used in all the tests. The distance from the end of the water hole to the surface of the tip was 0.255 in. in all cases.

The refrigeration consisted of a dual Frostrade unit, model 1502. This unit employed a 50 per cent methyl alcohol solution as the coolant.

First Series of Tests

In the first series of tests, normal standard electrodes were used. The temperature of the refrigerant was held to 0 deg. F. Although even lower temperatures are a decided advantage to welding, they increase both the initial and operating costs of the equipment to a point where they offset the increased production obtained. Test runs were made on the three thicknesses of bare aluminum alloy most commonly used in production—0.020, 0.040, and 0.064 in. sheets to determine the percentage of increase of efficiency at coolant temperatures ranging from 50 deg. F. down to 0 deg. F. (Actual measurement of methyl alcohol temperature in tank.) All sheets were cleaned in the production cleaning tank with a common alkaline solution. Time lapse between cleaning and welding was approximately 1 hr.

The temperature during all test runs was carefully checked to determine whether or not the refrigerator had sufficient capacity. Although the temperature curves obtained (Figs. 5, 6 and 7) appear to be erratic, it must be remembered that the Freon compressor unit lagged behind the thermostat by some few minutes during the test runs on the 0.020 and 0.040 in. material (Figs. 5 and 6). The results on the 0.064 in. sheet (Fig. 7) were the most constant because the compressor being balanced by the load ran continuously in maintaining the selected temperature range.

The greatest efficiency of the cooling process was attained in these tests below 30 deg. F. Between 50 and 30 deg. F., the gain in efficiency is relatively negligible. From 30 on down to 0 deg. F., there is a sharp increase in the number of welds run before pick-up becomes evident. At 0 deg. F., there is an average of 300 per cent increase in efficiency over that of the 30 deg. F. temperature.

Second Series of Tests

The second series of tests were made in order to obtain a comparison between the operating temperatures and characteristics when using standard spot welding electrode as in the first tests (Fig. 3), and the new

Frostpoint electrodes (Fig. 4). Aside from the introduction of this electrode, exactly the same equipment was used in the second series as in the first. Tests, however, were confined to 0.064 in. material.

One $\frac{5}{16}$ in. Frostpoint electrode and one $\frac{5}{16}$ in. standard copper alloy upper electrode were prepared for this series by placing a 4 in. radius contour on the tip of each. A 0.033 in. hole, located 0.031 in. from the circumferential tip surface, was drilled through each electrode at right angles to the center line of the respective tips (Fig. 8).

A standard electrical temperature measuring device was used to which was coupled an iron constantan thermocouple. This thermocouple (0.030 in. in diameter) was inserted into the 0.030 in. holes which had previously been drilled in the two electrodes. It was believed that by thus placing the thermocouple only 0.031 in. from the welding surface of the electrode, a temperature reading could be obtained which would be indicative of surface temperatures while welds were being made. The indicating instrument was carefully shielded and placed approximately 10 ft. from the welder to prevent the magnetic field from interfering with this operation. The inertia of the instrument made it necessary to introduce an elapsed time limit because it was impossible to get a direct reading.

The Frostpoint was placed in the upper electrode holder and the standard electrode in the lower holder. The thermocouple was connected to a Lewis potentiometer Model 14 PO with a range from -40 to 550 deg. F. Under these conditions, and with the thermometer on the refrigerating unit reading -12 deg., the temperature in the Frostpoint electrode was -8 deg. The temperature in the standard electrode fluctuated between -2 deg. and $+1$ deg. This difference is quite noteworthy inasmuch as it shows that the thermal efficiency of Frostpoint is much higher than that of the conventional type of electrode, even with the machine at rest.

At first an attempt was made to weld a given number of spots on the 0.064 in. material and then take almost simultaneous temperature readings on both upper and lower electrodes. The speed at which the thermal changes occur, however, made it impossible to follow this procedure. Consequently, it was necessary to take readings on only one thermocouple per test. For convenience, all runs were made with the electrode

to be tested in the upper holder and a standard type electrode with flat tip surface in the lower holder.

Final Test Procedure

The procedure finally decided upon and used during the remainder of the readings taken was standardized as follows:

An elapsed time type electric timer, reading in tenths of a second, was placed within reach of the welding operator. It was decided to take readings on both heating and cooling cycles after each series of spots. However, the damping effect of the potentiometer made it impossible to obtain split-second readings. Consequently, only cooling cycle readings could be obtained. The heating curve was estimated after plotting the cooling curve and therefore can be considered only as approximate. When the contactors opened to initiate the fifth spot of each series the electric timer was started. (A pre-

liminary test had shown that with either type of electrode, maximum tip temperature was reached after approximately three spots.) When the potentiometer balanced at its previous temperature setting, the timer was stopped. In this way, the time interval required for the electrode to cool to the desired temperature was recorded.

There may be some question as to whether or not the thermocouple was affected by the electrical field to which it was subjected as each weld was made. While it is true that such an electrical field may have a slight effect upon the accuracy of the thermocouple, its extent is so small that for all practical purposes the potentiometer reading may be assumed to be indicative of the true surface temperature.

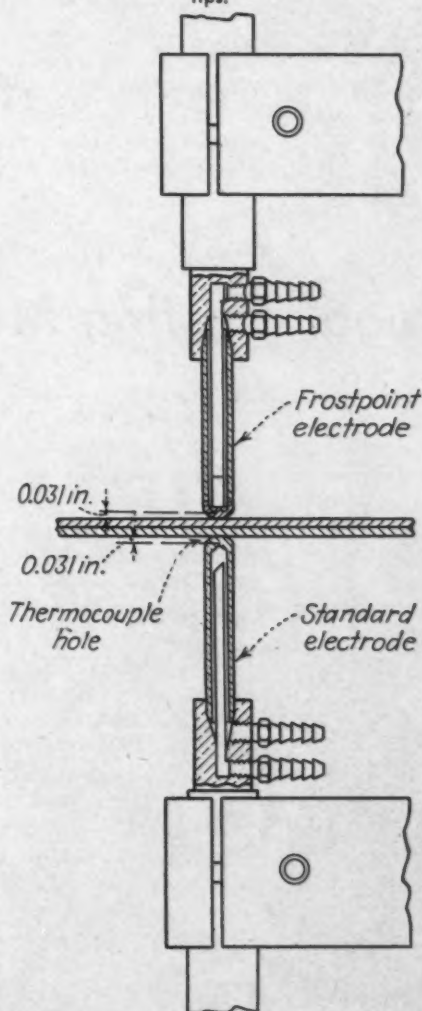
The peak operating temperature for each different type of electrode were determined by running continuous spots and increasing the potentiometer setting until, at the highest thermal status of the electrode tip, the potentiometer just balanced.

From readings obtained by the above procedure, a time temperature curve, Fig. 9, was plotted for each electrode tested. These curves represent the cooling curves after a peak operating temperature, when cooled with the refrigerant temperature shown. The peak heat was placed at the proper point on a continuation of the cooling curve. The heating curve could then be approximated between this peak point and the starting electrode temperature. Because of the slope of the line, the error involved by such approximation would be negligible.

Conclusions

Although this investigation of thermal conditions in welding electrodes when refrigerated was merely an elementary study of a problem which merits a much more complete examination, a number of important points were brought out. For instance, the gain in production through the use of refrigeration was tremendous as far as tip conditioning was concerned. It enabled the welder to utilize the higher speed ranges of the machine. This one factor of refrigeration, however, was not sufficient in itself to reduce electrode pickup to a minimum. It has been pointed out that even when the old type electrode is held at 0 deg., a drop of water placed on the sheets turns to steam during the first weld. This indicates a surface temperature exceeding 212

FIG. 8—Test setup for comparing the efficiency of a Frostpoint electrode with a standard copper alloy electrode. The thermocouples were placed in drilled holes 0.031 in. from the surface of the tips.



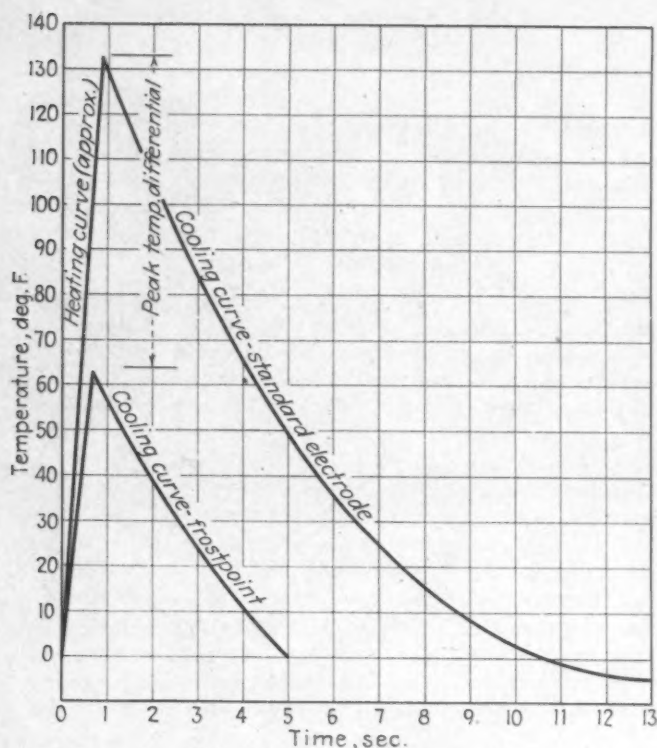


FIG. 9 — Cooling cycle curves plotted from test data taken on both standard and Frostpoint electrodes. The heating curves were approximated from actual peak operating temperatures. The superiority of the Frostpoint design is clearly indicated.

deg. caused by slow heat transfer.

A further series of tests has shown that this condition does not exist with the Frostpoint electrode and that (in test runs) up to 5000 welds can be made without dressing these electrodes. Furthermore, the test welder with automatic feed continued to produce clean welds up to the point where the constant hammering had finally caused deformation of the electrode face with a consequent loss of

current density and shear strength.

However incomplete this investigation may be, it does show conclusively that an electrode of the Frostpoint type is far superior to any of the standard designs. The improvement of electrode design fills a long-felt need for a more efficient method of cooling spot welding electrode tips. Much time and money have gone into the development of a satisfactory refrigerator and circulator for the elec-

trode coolant. It is now gratifying to see—for the first time—an improvement in the thermal efficiency of the electrode itself. Indeed, the only spot where the effects of cooling are desired is the contact surface of the electrode. Any development leading to an improvement of heat exchange in this area is certain to be of great value.

To obtain more complete statistics on the performance characteristics of these electrodes, it would be necessary to run a considerable number of cooling curves, using various coolant temperatures. A complete picture can be obtained only by such procedure. If this investigation is made, it would also be well to study both heating and cooling curves as well as their relationship to the welding cycle. Such a method would require time and temperature measurements of extreme precision. Accuracy of this degree can be obtained only through the use of oscillographs which could record the wave form of the welding current and then relate it to the heat cycle of the electrode. Information revealed by this type of investigation would be valuable to all those concerned with the spot welding of aluminum and aluminum alloys because of its pioneering nature.

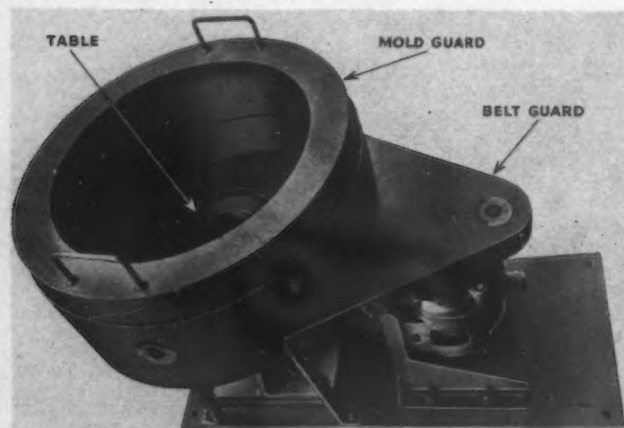
Acknowledgment

The author wishes to acknowledge the work of Messrs. M. S. Carpenter and J. Hunt for their work on the cooling curve tests.

Centrifugal Casting Machine

A VERTICAL centrifugal casting machine for handling molds up to 24 in. in diameter and 12 in. in height has been placed on the market by the Centrifugal Casting Machine Co., Tulsa, Okla. This unit, shown in

the accompanying illustration, can be used to produce both ferrous and non-ferrous castings. The entire unit is integrated on a single base so that it may be moved about as a unit if necessary.



This machine is said to be especially suited for permanent mold centrifugal castings of bushings with dimensions such that the length of the bushing does not appreciably exceed the diameter. Smaller castings of a design not suitable for permanent molds may be economically produced

in dry sand molds.

The manufacturer of this unit reports that for the type of work most suitable for production on this machine continuously variable speed control is not necessary. However, the speed of rotation can be adjusted 378 to 1640 r.p.m. by varying the size of the sheaves on the table and on the motor.

The company claims that tensile strength of non-ferrous alloys can be doubled, when centrifugally cast, while elongation can be trebled and hardness increased up to 20 per cent, the exact improvement, being dependent upon the alloy cast. This machine is finding particular application in producing aircraft bearings in permanent molds. Properly made centrifugal castings, the company reports, can pass X-ray inspection better than 99 per cent.

REVERE OPENS LARGEST MAGNESIUM SHEET AND STRIP ROLLING MILL IN THE WORLD AT BALTIMORE

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Some typical uses in addition to transportation: various small mechanical parts; reciprocating elements in textile machinery; works of calculating machines; housing for portable machinery; typewriter frameworks—the possibilities are almost endless it would seem. As developments ensue, Revere will be ready to supply requirements and offer appropriate technical advice.

The new Research and Development Department of the Magnesium-Aluminum Division at Baltimore will be of material aid in working with Revere customers in the solution of any of their particular manufacturing problems.

Manufacturers who would know more of the possible adaptability of the various Revere magnesium alloys to their needs, are invited to write us, *without obligation*. Address all inquiries to:

Revere Copper and Brass Incorporated, Magnesium-Aluminum Division, P. O. Box 2075, 1301 Wicomico Street, Baltimore 3, Maryland.

BUY TODAY MORE WAR BONDS AND PAVE THE WAY TO VICTORY

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It is indeed significant that Revere—the oldest name in the entire non-ferrous industry—now becomes associated on a large, important scale with the newest metallic material whose almost magical lightness and versatility predestine it to an epoch-making future.

It may be well said that the pioneering spirit of Paul Revere himself still carries on with all its trail-blazing fame.

The Company is planning a limited production for the immediate future, but will increase the quotas until the mill reaches its capacity in January, 1944.

Three Important Alloys Offered

Revere will make three most commonly-used sheet magnesium alloys.

Revere Magnesium "M" will be a magnesium-manganese alloy, possessing moderate strength with good forming characteristics.

Revere Magnesium "J-1" will also be offered. This is the highest strength sheet on the market, used principally by the airplane industry. This is a magnesium-aluminum-zinc alloy.

In addition, *Revere Magnesium "FS-1"*, a magnesium-aluminum-zinc alloy will be produced. This alloy will possess higher physical characteristics than "M", but lower than "J-1" and, combining with these improved strengths, it will also possess a good forming quality.

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Assembly Line . . . STANLEY H. GRAMS

• **Management of big Navy ordnance plant at Detroit is transferred from Hudson to Westinghouse . . . Continental Motors will build Rolls-Royce engines . . . United Auto Workers take incentive pay stand.**



DETROIT—Management of the Naval Ordnance plant at Centerline, in the suburbs, was transferred last week from Hudson Motor Car Co. to Westinghouse Electric & Mfg. Co., after several weeks of rumors that a shift was in the offing. It was the first government plant to be switched in this area, although such action has not been unprecedented elsewhere in this war.

The Navy inferred that the transfer was dictated by a desire to obtain higher production volume and quality. It does appear to have been a fact that output at the gun plant has not been up to expectation, but the reasons for this are obscure.

One fundamental problem which has been remarked on by technical men has been that the concept of operations at the Naval Ordnance plant has run counter in many ways to the automotive orthodoxy of mass volume. The concept of the plant in Navy thinking seems largely to have been one of a special-order machine shop as well as a facility for mass output. Evidence of this is clearly apparent in the fact that of 7000 employees scheduled for work at peak production, 4000 were to be skilled machine tool operators and mechanics. In contrast to automotive practice of combining operations in progressive steps under one roof, the Arsenal consisted of 14 buildings whose average size was little more than 100,000 sq. ft. each, the gun building itself contain-

ing 200,000 sq. ft. for Oerlikon gun output. Other manufacture includes fire control and direction apparatus, and parts for gun mounts, torpedo tubes and catapult guns.

The variety of production in this comparatively small space, coupled with the recurring job lot business, undoubtedly posed management difficulties for a company accustomed to mass assembly work.

There were difficulties, too, in maintenance of employment. Whether a fault of management or the geographical location of the plant, it has been a fact that turnover at the Ordnance plant has been abnormally high, probably the highest for any big plant in Detroit area.

Plans call for continuance of present production and payrolls. In the latter respect, the shift of management poses several problems.

First off, the administrative and supervisory personnel at the facility were largely transferred from Hudson's main works. There has been no indication whether Hudson will be free to recall them. As for the workers themselves, they are tightly frozen

into their posts and cannot be moved back to their original jobs, it is understood, this being one of the provisions in the management transfer. On this same score, the shift puts the United Automobile Workers Union, through its Ordnance plant local, in negotiation with a management which is more distinctly not automotive, and which is more likely to deal with such unions as the United Electrical Workers, or others. But the UAW indicates it intends to hold on to its local, regardless.

These problems, interesting phases of the overall situation, remain to be solved.

One more observation: The long term aspects of the affair must take into account the fact that Westinghouse is now operating in the Detroit area for the first time. If pride in automotive techniques and abilities is based on fact, Westinghouse may be attracted to Detroit as a permanent manufacturing point for some of its work. The Detroit Board of Commerce may be interested in this.

Hudson's upset was partially balanced by execution of new letters of

TANK ASSEMBLY: Details on Ford built tank engines are now available.

The engine develops 500 hp. at 2600 r.p.m. Each cylinder has four valves operated by dual camshafts for each cylinder bank. Adaptability of the engine to mass production methods was made possible by such features as a cast, rather than forged, crankshaft and flywheel; one-piece copper-silicon steel valve operation push rod; simplification of vertical drive shafts; centrifugal casting of cylinder liners; and use of refrigeration units to shrink cylinder block sleeves.



INSIDE STORY

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You How*



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COMPETENT inspectors

"Feel" errors are ELIMINATED

ALL okay parts are passed;
ALL out-tolerance parts are
rejected

Work is checked with LABOR-
ATORY precision either at the
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THERE is no argument over rejected parts when P&W Electrolimit Comparators take over. You set up the required limits with master gages, and from then on the parts are either right or wrong. The gage picks up any error and magnifies it electrically up to 20,000 times. That error becomes a large needle movement across a dial . . . so easy to read that even the rawest industrial recruits have no trouble. Pratt & Whitney Electrolimit Comparators have made history in the war effort, and will do

the same thing some day in the peace to come.

JUST PRINTED: the new bulletin illustrated above — "P&W Electrolimit Internal Comparators" — tells the "inside story" . . . the facts about fast precision checking of holes. A companion piece covering P&W Electrolimit *External* Comparators is also available. Either or both will be sent promptly to company executives who request it on their own letterheads.

PROMPT DELIVERY



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

THE IRON AGE, October 14, 1943—101

intent to produce cabins on subcontract from Bell Aircraft Co., for Airacobra P-39 pursuit ships. Work will be undertaken at the main plant.

While Hudson was losing an operation, Continental Motors gained one. With schedules impaired by cutbacks on tanks, for which it was the major powerplant supplier, Continental regained lost ground by winning selection as a producer of Rolls-Royce Merlin engines, hitherto manufactured exclusively by Packard Motor Car Co.

The majority-owned subsidiary, Continental Aviation and Engineering Co., will build the liquid-cooled Merlins in its outstate Michigan DPC-owned plant. A high-power radial aircraft engine heretofore built there will be transferred to the Continental Motors plant at Garland, Texas.

There are really mammoth problems involved in this manufacturing reshuffle. The Texas plant is more than 1,000 miles away from Michigan, and tooling has to be transferred with minimum production loss. At the same time, proviso has to be made for an early start on output of Merlins, admittedly the most complicated of the aircraft engines to build. Continental's genial president, C. J. Reese, has acute problems ahead of him, but the assignment of the job indicates that the Army has faith in his ability to solve them.

War program transfers also re-

acted this week to the benefit of Standard Steel Spring Co., whose manufacturing pool for heat treating of armor plate (THE IRON AGE, Nov. 5, 1942, page 70) lost business through reductions in tank schedules.

Standard Steel Spring Co. has subcontracted a large contract for heavy truck axles. Indicative of the size of the job is the fact that about \$20,000,000 in machine tools are reported required. Work will be done at Madison, Ill., in a plant heretofore used by General Steel Castings Corp. for production of tank armor.

This output is a major part of the oncoming heavy vehicle production program. Mammoth heavy trucks will be produced—mammoth in volume and mammoth in respect to the size of the units themselves.

Army people are going on the theory that, as the invasion of Europe advances, destruction of rail lines and facilities, particularly locomotives, will be so widespread that transport will be severely impaired. Accordingly, the blueprint calls for use of great fleets of trucks of 7-10 ton capacity, and up, a sharp contrast to the 2-2½ ton units which have been standard for transport use. Indications are that this heavy military truck program calls for a volume of assemblies well into six figures. This is a perfectly fabulous total for vehicles this size; in 1941, the last full

civilian truck production year, only 14,458 trucks were produced in sizes of 5 tons and up.

AT Buffalo last week was held a stormy annual convention of the United Automobile Workers Union. Factional fighting within the union and differing viewpoints on incentive pay provided plenty of fireworks.

In one of the most significant actions of the convention, the union turned its back on incentive pay plans, adopting a resolution, 1200 to 800, prohibiting extension of piece-work programs in plants with union contracts. The resolution provided that plants now working under incentive systems could continue to do so, but international officers were instructed to discourage "incentive pay thinking," and seek instead "equal pay for equal work arrangements."

This action, a victory for forces led by Walter Reuther, snarls further the limping progress of incentive pay programs, which management and service officers look upon as the only possible means of counteracting the labor shortages in industrial areas.

Uncharted in the stand was what action might be taken if NLRB hearings end in orders from that agency to insert incentive pay deals in pending contracts. Such issues are now before the board or will be in major automotive contracts awaiting ratification. Presumably, the union could not refuse to sanction such schedules under NLRB mandate, despite the resolution, unless a John Lewisesque walkout was taken.

Ford Begins Expansion of Bomber Building Program

Detroit

• • • Expansion of the B-24 Liberator bomber building program has begun by the Ford Motor Co. Nearly every building of the company in the state will be utilized.

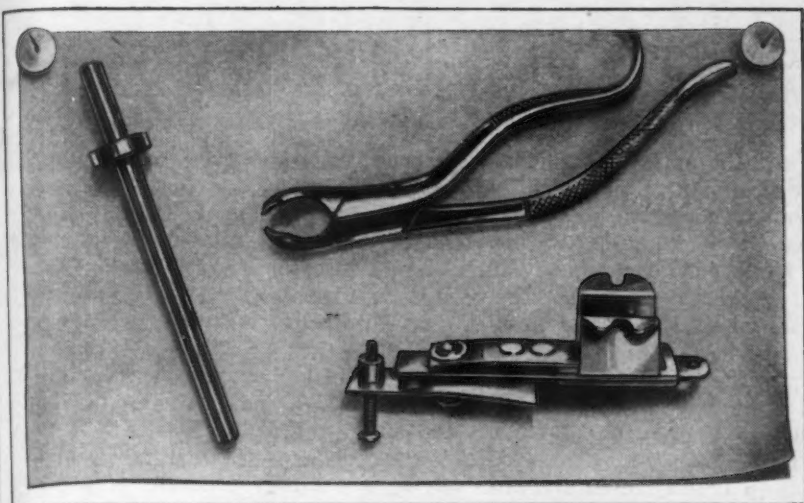
A large part of the space in the Highland Park plant has been converted to the fabrication of bomber sub-assemblies, including nose-side panels, fuselage tail cones, the outer wing and various hydraulic assemblies.

Space in the Lincoln plant is devoted to "dress-up" of 1200 hp. Pratt & Whitney engines and the manufacture of wing bulkheads, nose rings and air ducts.

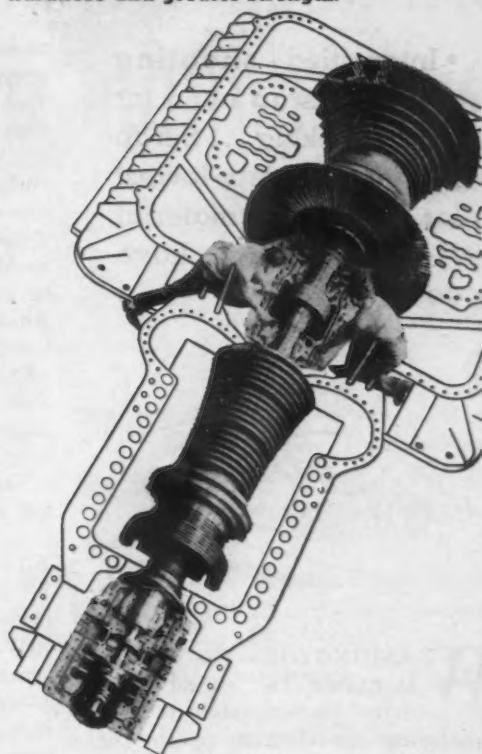
The tire manufacturing building at River Rouge has been given over to machining of parts and assembly of bomber landing gear.

NEW WEAPON: Newest protection on the flying fortress bombers is this power-operated "chin turret." It has two .50 caliber guns.





Long-wearing valve stems, heat control assembly units and dental instruments are made from Carpenter Stainless—for positive protection against corrosive elements, extra hardness and greater strength.



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BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

• **Intensified shooting war points up need for scrap backlog . . . Scrap margin of safety lowest for any critical material . . . Many sources have dried up.**



WASHINGTON—The WPB has instituted its second scrap drive. Unfortunately it is encountering considerable apathy because of the general feeling that the war is proceeding rapidly and favorably for the Allied nations and that therefore the need for scrap has abated. In reality there is every reason to believe that the shooting war has just begun. Indications are that more steel and scrap will be shot off in the next 90 days than has been fired since the post-Pearl Harbor period up to the present. In any event, no matter how close or far away victory may be, it is imperative that there should not be a shortage of scrap—a shortage that might spell defeat and the doom of the Allied nations. An excess of 100,000 tons of scrap infinitely is preferable to the lack of one ton.

The present drive deserves every possible encouragement. It should be understood in terms of insurance against conditions later in the Winter. It should not be interpreted in terms of the present inventory. No open hearth furnaces are down today nor is there any present danger of them going down, but after October weather conditions will act against preparation of scrap in the North and the Middle West.

The current campaign is described as a Victory Scrap Bank Drive. Actually, wherever possible, scrap will be trucked directly to dealers' yards but if dealers are unable to absorb all of the material it will be put away in Victory banks.

There is an important aspect to the

present scrap situation that did not prevail with respect to the first drive. This is the attitude of the government regarding the termination of contracts. While it is not stated officially, it is known that some consumers feel that to fill their inventories to a higher level is a matter of national safety and that they should be given protection for buying above what their needs may be. What is today a 60-day supply may after the war become a 120-day inventory with a much lower value. Likewise, scrap dealers believe that if they are asked to go all out in the scrap campaign in the future they should have a market at OPA ceiling prices.

FROM a point of publicity there is also a difference between the present scrap campaign and that of 1942. Last year the drive derived great emphasis from the \$2,000,000 advertising fund that was raised by steel companies, scrap dealers and other sources. It also received a tremendous amount of publicity from the daily newspapers, which did a bang-up job of publicity in their news, editorial and advertising columns. This year, owing to curtailment of newsprint and the fact that they have come forward generously in the war fund campaign, it is not expected that the drive will receive as widespread publicity as it should have. Hence, the responsibility for assuring the success of the drive becomes all the greater for scrap dealers and the WPB Salvage Division.

To avoid many of the errors of last year, scrap dealers are being integrated into every detail of the campaign. Steel mills have pledged

themselves to take every ton of properly prepared scrap and WPB has recommended a price formula for drive scrap that will give dealers a margin for proper preparation. Last year, dealers say, the Salvage Committee pressured them to over-bidding but this year care is being taken to see that dealers are in an advantageous position to take material in and properly prepare it.

It is not expected that this year's drive will bring in nearly as much scrap as was collected last year. The 1942 drive netted between 3,000,000 and 6,000,000 tons, probably nearer the lower figure. If this year's drive nets half as much as was gathered last year it probably will be successful. The drive has of course been well-timed. October is a propitious month for the campaign. It is probable that after the present drive which is to conclude Nov. 15, in most states, plants will be made ready for the 1944 supply which will perhaps involve greater concentration on over-ceiling material.

With respect to tonnages, stocks of scrap in the hands of consumers and suppliers now total 7,000,000 tons. Under normal conditions this would be an ample backlog but actually it is claimed that the margin of safety in scrap is narrower than in any other strategic raw material. The current rate of monthly consumption is 4,600,000 gross tons. Taking into account the fact that home scrap constantly being produced in current inventories measures only 10 to 11 weeks at a time when weather conditions are favorable, it is obvious that steps should be taken now for the collection and preparation of scrap

BACK HOME AGAIN: Back from their tour of war fronts, these five Senators gave their report to fellow Senators behind locked doors. Left to right they are: Albert B. Chandler (D-Ky.), James M. Mead (D-NY), Richard B. Russell (D-GA.), Henry Cabot Lodge, Jr., (R-Mass.) and Ralph O. Brewster (R-Me.)



RAMIX is helping make that extra two million tons



Installing front wall of an All-Ramix hearth by ramming behind form. No skilled labor required.



EVERY day, in many ways, Ramix helps open hearth and electric furnace men to "keep 'em rolling" . . . to make that extra steel the war agencies are calling for.

That Ramix saves time in new hearth construction is well known. It is the usual thing to complete a Ramix hearth a week to 10 days sooner than one of conventional magnesite. This means 10 to 15 extra heats . . . 2,000 or more extra tons of steel, in a 200-ton open hearth.

Ramix also is helpful in hearth repair and maintenance. Nearly any furnace man can name instances where he has made quick, dependable repairs with this material. For example, in one shop, whenever a furnace is down, a man goes over the banks with a prod and picks out pieces of metal. The holes are rammed with Ramix. The hearth is kept sound and safe and the delay time substantially reduced.

Every superintendent will find a dozen or more ways in which this chemically-bonded, cold-ramming magnesia refractory can be used to advantage. Basic Field Engineers suggest uses, too. Busier now than ever, these service men are never too busy to lend you a hand when you want help or advice on basic hearth refractories. We're in this with you to make that extra steel for the 1943 goal.



BASIC REFRACTORIES, INCORPORATED
CLEVELAND, OHIO

to be ready at hand during the bad weather that lies ahead.

During the first half of the year at a time when scrap stocks should have been increasing for seasonal reasons, inventories actually decreased about 14,000 tons.

The decrease would have been greater had not the heroic John L. Lewis staged a coal strike in June which reduced the production of steel and consumption of scrap. Usually the last half of the year is a period of declining inventory. Hence, while stocks of scrap currently are adequate, it is felt by government, steel and scrap authorities that as a matter of protection every effort should be made while weather conditions are favorable to build up inventories.

THE inventory situation is very spotty. Mills east of Pittsburgh are reported to be well supplied while at Youngstown, Ohio, St. Louis and Chicago most consumers can absorb considerably more old material. Total inventory figures are not the only gage because in the spring of 1942 when consumers had only 4,000,000 tons in the aggregate some open hearth furnaces were down for lack of scrap. While these furnaces now have a fair supply, tightness has developed in cast iron grades. So rapid

has been the expansion in the electric furnace phase of the industry—this year about 16 per cent of all steel will be alloy made in both open hearth and the electric furnace—that the electric furnaces have been forced to use some old material that is inferior.

Over the past few months the intake of unprepared scrap into dealers' yards has declined alarmingly. This is due to the fact that the 1942 drive pretty well cleaned out the country and homes and, it is charged that the peddler and the collector have been driven out of business by the OPA schedules. The flow of industrial scrap has declined due to cutbacks in war production programs

but this situation may be remedied shortly. The railroads are repairing and restoring to service equipment which they ordinarily would scrap. This is evidenced by recent wrecks. The only source of scrap that is increasing is overseas scrap but this amounts to only a drop in the bucket. A further fact is that the Great Lakes movement of iron ore this season will be only about 86,000,000 tons compared with 92,000,000 tons in 1942.

Most of the scrap in the 1943 drive will be of two kinds, farm and dormant, the latter from factories. Nevertheless, it is felt that an all-out drive is necessary in order to get momentum. Scrap dealers welcome the drive.

Speed in War Contract Settlement Payments Urged; Four-Point Plan Offered

New York

••• Speed in government payment of contract termination claims has become the almost universal demand of groups considering the matter during the past week. Legislation is asked which would make payment of the bulk of any claim within a brief and limited time compulsory for the government. Also recommended were

immediate loans to companies suffering hardship due to termination, establishment of a unified settlement board to handle all agencies' contracts, decentralization of staffs to expedite paper work and other features.

The Committee for Economic Development, headed by Paul G. Hoffman, Studebaker Corp. president, principal post-war planning agency of American business, emphasized the urgency of speed in payments and set forth a four-point program designed to assure satisfactory contract terminations with minimum hardship to industry, particularly small firms.

These points were: (1) Creation of a unified contract settlement board to act for all contracting agencies, (2) decentralization of settlement machinery, (3) additional court facilities to handle disputes, and (4) mandatory loans by the government to protect contractors pending settlement payments.

Melvin T. Copeland, chairman of the Massachusetts Committee on Post-War Development warned in an address last week that prompt settlements must be made to facilitate the switch-back to civilian products and strongly endorsed the Murray Bill which would make it compulsory for the government to pay within 30 days 75 per cent of the amount certified by a contractor as due on a contract.

Indicating some military understanding of the seriousness of the re-conversion period, Col. Bryan Houston, assistant director of the purchases division, Army Service Forces declared that government and industry ultimately may have to sacrifice financial exactness for speed in settlement.

THE BULL OF THE WOODS

BY J. R. WILLIAMS





SPEED-UP THREAD INSPECTION



The Sheffield Thread ROLL-SNAP Gage is a combination GO and NOT GO limit gage for checking maximum and minimum tolerance limits of male threads in one operation. It determines whether or not the thread of the work part is within tolerance in lead, pitch diameter, thread form, roundness and straightness.

Inspection with this one gage is much faster than thread ring gage inspection because:

1. Both tolerance limits are checked in one pass.
2. There is no tendency to bind or cramp.
3. There is little tendency for dirt or chips to collect on the thread rolls and interfere with gage accuracy.
4. There is minimum of friction between threads and thread rolls of the gage because the latter are free to rotate.

WRITE for Bulletin G-662-143

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**THE SHEFFIELD
CORPORATION**



Dayton 1, Ohio, U.S.A.

• Lack of sense of urgency appears to be slowing down labor, management and war agency leadership . . . Announce shift hour innovations . . . Charges placed against two shipyards.



SAN FRANCISCO—"Lack of a feeling of urgency in getting out material for the war effort was invariably the basic underlying reason for absence given by workers to interviewers."

Such was the conclusion and summary of Henry T. Buechel, University of Washington economist who conducted a survey of absenteeism in Seattle war plants, based on impartial interviews with 405 war workers selected at random representing one out of every hundred wage earners in 12 plants studied.

This lack of a sense of urgency seemed the principal barrier to impatient captains of war industry and determined but thwarted procurement officers and public officials attempting to focus the hydra-headed war effort and to maintain schedules in spite of increasing apathy, fatigue, distraction and disillusion.

There were various official indices and affirmation of relaxation: The Coastwide network of volunteer plane spotters was suspended until further notice; it was indicated that blackout restrictions and regulations near the seacoast would be relaxed; predictions of rain and reports of the weather appeared in newspapers; a racing season opened at Bay Meadows and the first day's "take" of over half million dollars was the greatest in the history of the track; the Third War Loan was considerably undersubscribed in West Coast states. Despite parades, billboards, full page

newspaper advertisements and direct mail patriotic appeals, public interest was most enthusiastic and responsible to football games, World Series reports, a four-way race for mayor and threatened reduction in the value of gas ration coupons.

A COMMITTEE for congested production areas directly under the "Office of the President" has set up a small but important area headquarters for the West Coast in an attempt to coordinate all public facilities in congested production areas, cooperating with state and local governments and coordinating all Federal agencies concerned. Since every principal city west of the Rocky Mountains is classified as a Group I acute labor shortage area and about 60 per cent of all the population lives in these congested zones, the President's Committee had its few but careful hands full. After two months' study and reviewing reports and conclusions from municipal, state and Federal agencies, it was concluded that schools should be at the top of the urgency list, followed by food, housing, fire protection, transportation and 15 or 20 other functions and facilities in the order of their estimated importance.

Judged by appeals and representations by leaders of labor, the subject of food belongs at the top of the list, closely followed by housing and transportation. Passionate pleas for hot food facilities in shipyards have become so insistent that considerable sums of money, material and labor are being devoted to the installation of cafeterias and mobile steam tables. The Navy has installed superior restaurant equipment within its yards at Mare Island, Bremerton and newly at Hunter's Point, and all principal maritime and private Navy construction yards are being forced to follow suit.

INDUSTRIAL management and production directors will watch with eager interest two innovations in shifting hours instituted by major Coast plants, one an aircraft plant and the other merchant shipbuilding yards.

North American Aviation has instituted two 10-hour daily shifts pro-

viding a 60-hour week for men and 50-hour week for women. The first shift starts at 6:30 A. M. each day and, with half an hour for lunch, finishes at 5 P. M. The second shift starts at the same hour and with a half hour for evening lunch concludes at 3:30 A. M. Three graveyard hours remain for maintenance, cleaning and assembly of materials.

Men work a six-day week and women a five-day week. Representatives of management state that the new arrangement will cost the company more money to operate because of a greater number of hours of overtime pay, but increased production and longer availability of skilled workers, foremen and superintendents is expected to justify the added expense.

Marinship, the Bechtel Maritime five-way yard at Sausalito on San Francisco Bay, building tankers, announces a 10 min. overtime plant at shift change "to standardize production, to continue work done on sequence and to create genuine around the clock shift responsibility."

Every hourly worker will be paid time and a half for an extra 10 min. at the start of his shift, making an hour of overtime every week. Each new shift starts at its former time and outgoing shift workers transfer tools to oncoming shift men at the job site. Each tells his relief exactly what has to be done to complete the job on which he has worked during his previous shift.

Instead of the former practice of an outgoing worker checking tools into the tool room and an incoming worker checking out the same tools, the transfer will be effected on the job and the outgoing worker will simply exchange the new worker's card for his own at the tool room. By adding the overtime pay to each worker's take-home wages, management expects to overcome the slowdown that has occurred three times a day during shift changes. Representatives of the Maritime Commission, management and labor joined in endorsing the plan in the interest of speeded up production.

CHARGES were aired against two West Coast shipyards, one on Puget Sound and one on Los An-

Announcing the "TOCCO JR. 15"

THE 10 SQ. FT. HEAT-TREATING DEPARTMENT



SPOT IT IN YOUR PRODUCTION LINE



• The new low-priced "TOCCO JR." induction Heat-Treating Machine.

Hardens, brazes, anneals, heats for forming small parts for wartime or peacetime products.

Motor-generator type. Capacity 15 K.W. output. Frequency 9600 cycles.

Floor area only 48" x 32"—slightly more than 10 sq. ft. Clean and devoid of radiant heat and hot gases. Can be located in production line, handy to related operations to avoid hauling.

Has all the product-improving, cost-cutting advantages of larger TOCCO machines.

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**HARDENING..BRAZING
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geles Harbor, each engaged in naval auxiliary construction, the one as a result of impatience for greater production and the other a civil suit alleging improper expenditure, accounting and approximation of materials and labor.

Los Angeles Shipbuilding and Drydock Co. is an old yard carrying over from World War I. It engaged in repairs between wars. Over three years ago the Navy left a \$42,000,000 contract for three repair ships and later added \$40,000,000 more for three plane tenders. Construction on the "Ajax" was begun September 9, 1940, with completion set for 36 months later. All three repair ships have been launched but none completed, and the tenders are laid down. Several weeks ago Consolidated Steel Corp. announced purchase of this yard.

At Seattle, Associated Shipbuilders is a lusty, progressive, independent, locally owned combination of a number of former Maritime repair, construction and general erec-

tion firms. Its contracts include Navy seaplane tenders and wooden mine sweepers. A force in excess of 10,000 is employed. The civil suit filed in the United States District Court charges that government paid materials and labor have been used for private benefit and that certain materials and labor were improperly charged to the government.

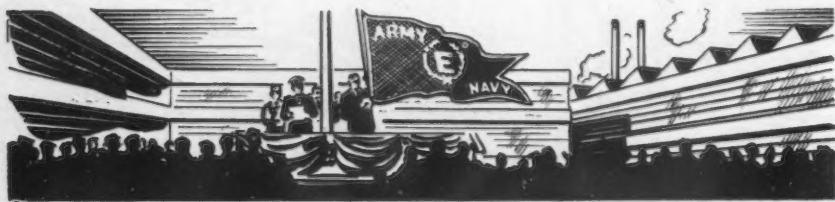
To war contractors and shipbuilders on the West Coast this appears to be the first of what may become many similar suits in connection with the renegotiation and interpretation of contracts, particularly as the amount of Naval and merchant ship repair work increases, as it is universally expected to within coming months.

Contracts for new construction, both for the Navy and Maritime Commission, are almost universally based on an original estimate, seven per cent of which becomes the fixed fee profits on the completed job. Labor and material are charged back to and paid for by the public, and allowable labor

scales and working conditions are specified in the contracts. These are often slightly more liberal than has been the private contractor's previous practice, but are uniform with civil service practice in Navy Yards.

On repair work, conversions and where no certain conditions can be stipulated in advance, profit to the contractor is based on a percentage of expenditures for materials and labor, usually 10 per cent, but always subject to renegotiation. Experience and practice have demonstrated that costs and difficulties in connection with repair work are more vexing, waste of materials and loss of tools and equipment are heavy and difficulties of organization and production are taxing. Labor is paid a higher hourly scale for repairs than for new construction, according to wage agreements held over from peacetime when repair work was uncertain and piecemeal.

So inconsistent and uncertain are the general terms, and facilities for repair that a clearing of the legal, and physical atmosphere will be universally welcomed by shipside contractors, yards and providers of facilities.



... Cited for Awards ...

Aldrich Pump Co., Allentown, Pa.
American Fireworks Co. of Massachusetts, Canton, Mass.
Art Metal Construction Co., Jamestown, N. Y.
Askania Regulator Co., Chicago
S. Blickman, Inc., Weehawken, N. J.
Central Tool Co., Auburn, R. I.
Cleveland Worm & Gear Co., Cleveland
Farval Corp., Cleveland
Consolidated Engineering Co., Naval Air Station, Patuxent River, Md.
Crucible Steel Co. of America, Sanderson Works, Syracuse, N. Y.
Davenport-Besler Corp., Davenport, Iowa
T. J. Edwards, Inc., Boston
Federal-Mogul Corp., Federal-Mogul Marine Division, Detroit
Gardner Machine Co., Beloit, Wis.
Henschel Corp., Amesbury, Plant, Mass.
Hess & Barker, Philadelphia
International Harvester Co., Indianapolis Works
Keasbey & Mattison Co., Plants 1, 2, 4, 5 and 8, Ambler, Pa.
Lakeshire-Marty Co., Plymouth, Wis.
Liberty Aircraft Products Corp., Farmingdale, L. I., N. Y.
Lion Mfg. Corp., Chicago
Lyon, Inc., West Chicago Plant, Detroit
National Fireworks, Inc., Plant No. 9, Bristol, Va.
Nelson Specialty Welding Equipment Corp., San Leandro, Cal.
F. P. Rosback, Benton Harbor, Mich.
The Texas Prefabricated House & Tent Co., Dallas, Texas
Watson Elevator Co., Inc., Englewood, N. J.
Westcott Valve Co., East St. Louis, Ill.
Fulton Syphon Co., Knoxville, Tenn. (third star)

Wheeling Corrugating Co., Wheeling, W. Va. (second star)
Gerrard Co., Chicago
Nash-Kelvinator Co., Propeller Division, Lansing, Mich.
Blaw-Knox Co., Steel Castings Division, Pittsburgh (second renewal)
Mid-West Forging & Mfg. Co., Chicago
Gladden Products Division, Glendale, Cal.
General Electric Co., Bridgeport Plant, Conn. (second star)
American Radiator & Standard Sanitary Corp., Louisville Plant
Davidson Mfg. Corp., Chicago
Duncan Electric Mfg. Co., Plant No. 1 and Plant No. 2, Lafayette, Ind.
E. I. du Pont de Nemours & Co., Inc., Arlington Plant, N. J.
Fitzgibbons Boiler Co., Inc., Oswego, N. Y.
Hercules Powder Co., Inc., Mansfield Plant, Mass.
Kiekhaefer Corp., Cedarburg, Wis.
Los Angeles Die Casting Co., Los Angeles
Master Finishers, Inc., Chicago Plant
McEvoy Co., Houston, Texas
Murphy Diesel Co., Milwaukee
National Engineering Co., Chicago
Ransome Machinery Co., Ransome Plant, Dunellen, N. J.
Tennessee Eastman Corp., Holston Ordnance Works, Kingsport, Tenn.
Ben Venue Laboratories, Inc., Bedford, Ohio
Whitehead & Hoag Co., Main Plant, Newark, N. J.
Ichabod T. Williams & Sons, Carteret, N. J.
Yale & Towne Mfg. Co., Philadelphia Division

Maritime Commission "M"

Inland Steel Co., Chicago
Inland Steel Co., Chicago (white star)

Davis Believes Present Mediation Methods Will Stay Cleveland

... William H. Davis, chairman of the National War Labor Board, in Cleveland this week for a meeting of the Cleveland Associated Industries, stated that the chances are excellent for the continuance of the tri-partite mediation board principle after the war. He stated that after the war, American economics will be no better able to stand strikes than during the present drive for greater war production, and the success of the War Labor Board's tri-partite (labor-management-public) system of settling labor disputes will likely form the pattern for the handling of such troubles as may occur in the post-war period.

Meehanite Men to Meet In Cincinnati Nov. 3 and 4

... The Meehanite Research Institute of America, Inc., will hold its annual meeting at the plant of the Cincinnati Milling Machine Co., Cincinnati, on Nov. 3 and 4. Important research data compiled by member foundries as a result of war production experiences will be presented and exchanged at the meeting.

A black and white photograph of a massive industrial hydraulic press. The machine is tall and complex, with multiple vertical columns and a large upper frame. It is situated in a dark, industrial environment, likely a factory or workshop. The lighting is dramatic, highlighting the metallic surfaces of the press.

1350 TONS HYDRAULIC UPSETTING PRESS

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ENGINEERS

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HYDRAULIC PRESSES · ROLLING MILLS
PUMPS · ACCUMULATORS

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Fatigue Cracks . . .

BY A. H. DIX

Scoop, Scoop!

• • • Every time we visit Washington our mind is forced clear down to the Plimsoll line by the burden of news we take on. To avoid straining our seams, we will therefore unload. We realize, of course, that we are running the risk of having the expert eye of our Washington editor, Leon Wesley Moffett, reclassify our cargo of hot scoops as 50 per cent barely body warm and the rest slightly moldy. But to our fond and uncritical touch, they sizzle, so here goes:

A still-private-but-probably-not-for-long citizen, who has just returned from a visit to England, where he hobnobbed with the pilots of the British war machine, said the optimists there believe the war in Europe will end in two months, the pessimists in ten months.

The highly conservative chief of one of this country's best war-informed bureaus thinks Germany will fold by November, '44, Japan a year later.

An OCD big shot thinks the prospects for a token bombing of this country are greater than ever. He reasons that token bombing is done when a country is losing ground, and when its own people badly need the psychological pick-up that comes from bombing the homeland of the enemy, even though of no military significance. So we brought our air raid warden's helmet and squirt pump out of the back closet in the cellar, but put them back when we read the Army's notice to skywatchers not to bother any more.

Ampler supplies of copper, aluminum and certain other materials do not mean more civilian goods, said J. A. ("Cap") Krug, who heads the Office of War Utilities. The making of finished goods takes labor, the thing we are shortest of. But there are exceptions. Lack of laundry facilities is a growing cause of absenteeism among war plant women. Cure: more washing machines.

The problem of solving postwar problems won't wait until the war is over, Paul Hoffman, chief of the Committee of Economic Development, told us, for when Germany quits about 80 per cent of the war will be over as far as output of war goods is concerned. The immensity of the task facing private business is evidenced by the fact that it will have to find eight or nine million *additional* jobs for service men and government workers who will be released when peace comes. Failure to solve the \$64 question means government control of industry. To find what you can do, write the C. E. D., Department of Commerce Bldg., Washington, for the new booklet, "Plan Post War Markets Now."

A well-known American, who recently observed the English scene, tossed out a bombshell by saying bluntly that in his opinion the English people will not want to go back to private enterprise after the war.

That will be all for now.

Free Movie

• • • We thought the Navy's Industrial Incentive Division had to do with pay incentives. It hasn't. Its job is to produce booklets, posters, films, etc., to stimulate production. If you make war goods you can borrow (for \$1) the most exciting movie short we have ever seen, "The Life and Death of the Hornet," showing the building, launching, operation, take-off of the Doolittle expedition, bombing, and sinking of the famed aircraft carrier.

If you have no projector or movie operator, the Navy will tell you where you can get both for \$17 for 1.5 hr., up to \$35 for 8 hr. Address Industrial Incentive Division, Navy Dept., 2118 Massachusetts Ave., N. W., Washington.

Bowlerized Sergeant

• • • To balance things up we would like to criticize a release issued by the Industrial Incentive Division,

purporting to quote Marine Sgt. E. J. ("Pop") Henshaw, an airplane crew chief:

We were bombed just about every night. Life on Guadalcanal was really rugged . . . There is still a whale of a lot of fighting to be done.

"Really rugged" and "whale of a lot" are not in a sergeant's vocabulary.

Physical Law Violation

Eric Johnston, U. S. Chamber of Commerce chief, says Washington is one place where sound travels faster than light. Mr. Johnston, we would like to put down here for the record, looks to our politically lay eye like somebody who is going some place, in high.

Smoke-Eater

• • • As you had a right to expect, it was your favorite family journal that plunged through the smoke surrounding the Air Corps' sale of more than a million dollars' worth of cutting tools at ultra-bargain prices, got the facts and gave them to you in the "Assembly Line," page 66, Sept. 30 issue.

The *Detroit Free Press* picked up the story and ran it first page, front center, of a Sunday edition. We aren't bragging about that, as it happens all the time. But we would like to thank the *Free Press* for calling us "the authoritative, national magazine of the metal-working industry." We like that. It has more punch than our own creation, "The World's Greatest Industrial Journal."

Usually the newspapers call us "the organ of the steel industry," which makes us gnash our teeth, as it gives the impression that our beneficent influence is confined to the steel-producing industry, when as a matter of fact the greater part of our rays spread over the whole finished metal goods industry—adzes to aircraft, shapers to ships, xenonometers to xylophones, and so on.

"The authoritative, national magazine of the metal-working industry." Superb phrasing.

Fractional Wholes

• • • A writer on letter-writing has this to say in an advertising journal:

Nor do we permit ourselves to be influenced by the crazy idea that all letters require a concluding paragraph.

Which reminds us of a Martini formula given us by a midtown bartender. "Two-thirds gin and one-sixth dry Vermouth," he said. "What about the other sixth?" we said. "Leave it out," he said. "That's what spoils it."

Threadbare Garment

• • • Most over-worked adjective in Washington today is "over-all." Everybody refers to over-all problem, over-all picture, over-all plan. All God's Washington chillun got overalls.

Aptronym

• • • While waiting in a WPB outer office, we read this in a *Chicago Sun* account of an automobile theft:

The car was stolen from D. W. Brew, a brewery salesman.

Puzzles

• • • The subway train schedule that brought last week's merchant downtown 80 per cent of the time, despite the fact that just as many trains run uptown, is this: downtown schedule, on the hour and at 5 min. intervals thereafter; uptown schedule, 1 min. after the hour, 6 min., 11 min., 16 min. and so on. He can catch an uptown train in only 1 min. out of each 5, but is exposed to a downtown train for 4 min. out of each 5.

If you can solve this in 10 min., give yourself an A plus, or an A for a 15-min. solution:

Two pre-war wine merchants entered Paris, one of them with 64 casks of wine, the other with 20. Not having enough money to pay the customs duties, the first paid 5 casks of wine and 40 francs, and the second paid 2 casks of wine and received 40 francs in change. What was the price of each cask and the duty on it?

Fairbanks-Morse Scales in Warwork

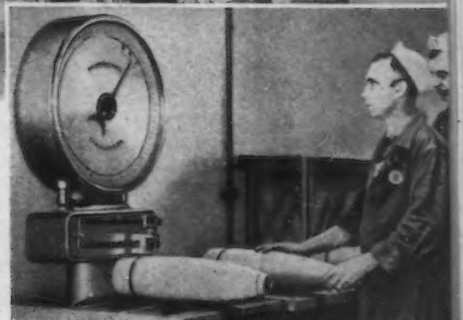


One of America's freight-carrying giants of the air getting a weight check-up on two Fairbanks-Morse Aircraft Scales and a Fairbanks-Morse Crane Scale.

WARWORK means *weigh-work* for Fairbanks-Morse Scales. They're weighing munitions ... food ... chemicals ... tanks ... aircraft ... shells ... just about everything, in fact. They are weighing at speeds which human hands can't match. They're weighing with accuracy that human eyes can't equal. They're working in endless shifts that human stamina can't endure. They're helping to speed up America's war effort on the production front, for Fairbanks-Morse Scales are "at home" on the production front, in peace or in war. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago, Illinois.



Weighing an "egg" for the Axis.



Correct weight for accurate gunnery.



Frozen eggs—NOT for the Axis!



Weighing charging materials at iron works furnace

FAIRBANKS-MORSE
Scales

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT



BUY WAR BONDS

Dear Editor:

COLORING STAINLESS STEEL

Sir:

In 1939 you published information on the Bachite process for coloring stainless steel. Can you give us Oscar Bach's address?

C. SCHREUR, Chemist
Shakespeare Co.,
Kalamazoo 2F, Mich.

● Oscar B. Bach Studios, 610 Fifth Ave., New York.—Ed.

DROP FORGING BOOK

Sir:

We are anxious to secure a good book on drop forgings and drop forging design.

CHARLES JOOST
Joost Mfg. Co.,
742 Bancroft Way,
Berkeley 2, Cal.

● The best book we know of is "Forging Handbook," by Naujoks and Fabel, published by the American Society for Metals, 7016 Euclid Ave., Cleveland, price \$7.50.—Ed.

DERMATITIS PREVENTIVE

Sir:

You recently published a list of manufacturers of dermatitis preventives. To be complete, the list should include Tarbonis Cream, a new specific for various skin disorders. It has been highly effective in cases of occupational dermatitis. . . .

E. M. ASQUITH
Tarbonis Co.,
1220 Huron Road,
Cleveland 15

DESULPHURIZING PIG IRON

Sir:

Page 42 of your Sept. 30 issue contains a digest of work published in the German magazine "Archiv für das Eisenhüttenwesen" by W. Oelsen and H. Maetz, on desulphurizing of pig iron with acid slags. Can you give me the exact reference?

R. P. HEUER,
Vice President
General Refractories Co.,
1600 Real Estate Trust Bldg.,
Philadelphia 7

● The translation was received from a foreign correspondent. The date of issue was not given. Great difficulties surround the obtaining of technical journals published in enemy countries.—Ed.

POST WAR MACHINERY VALUES

Sir:

We are very anxious to obtain information on the prospective post war value of machinery, particularly used machinery and its probable future market.

Do you know of any articles on this subject or the best sources of information?

GRACE DONOVAN,
Librarian
Western Electric Co., Inc.,
100 Central Ave.,
Kearny, N. J.

● No concrete information whatever exists on this subject, and nothing definite will be

available until a policy is established with respect to government-owned machinery, including that owned by the Defense Plant Corp., the Army and Navy. If all this equipment is placed on the market, prices will be much depressed. If, on the other hand, government-owned plants are padlocked, machinery greased, and kept for emergency purposes, machinery surpluses will be reduced to a considerable extent, and used machinery prices will be affected accordingly. Too much mist still surrounds the post-war situation to permit a competent weighing of the probable used machinery market.—Ed.

JAP MAP

Sir:

Your April 30 issue contains an article by T. E. Lloyd entitled, "Kyushu and Honshu Islands, Focal Points of Japan Industry." This article interests me a great deal, and especially so the large folded map included, showing locations of industrial plants in Japan.

I am at work on a revision of my book, "Reconnaissance Geography of Japan," and would like to make use of some of the materials in Mr. Lloyd's article. Are you able and willing to give me Mr. Lloyd's address?

GLENN T. TREWARTHA,
Professor of Geography
University of Wisconsin,
Madison, Wis.

● You may use all or any part of the information published. The address of T. E. Lloyd, Cleveland editor of The Iron Age, is 1016 Guardian Bldg., Cleveland 14.—Ed.

"BULL OF THE WOODS" BOOK

Sir:

I enjoy the cartoons by J. R. Williams in your magazines. Will you please tell me if "The Bull of the Woods" is made up in book form. I've heard many men ask the same question.

CHARLES B. FREEMAN
223 Chestnut Street,
New Britain, Conn.

● No, but the idea is excellent.—Ed.

SCRAP IN ARMOR PLATE

Sir:

The chart on page 102 of your Sept. 16 issues shows that 1000 net tons of armor plate requires 5481 net tons of raw materials. Of this amount 1407 tons is scrap and 1092 tons pig iron. As scrap also goes into the making of pig iron should not the scrap required be boosted somewhat, say between 300 and 600 tons?

ANON.
● About 4 per cent of pig iron (average) comes from scrap charge. Therefore, about 44 tons could be subtracted from the pig iron figure and added to the scrap total.—Ed.

ENEMY OWNED PATENTS

Sir:

"Fatigue Cracks" of Sept. 23 mentions a list of enemy owned patents now available. Enclosed is 15c. for a copy.

WALTER M. RUSSELL
Alien Property Custodian,
126 Broadway,
New York 5

● This is a reprint of the 11-page list of enemy owned patents recently published in The Iron Age issue of July 8, 1943. The demand exhausted our supply of copies of the issue, so we were obliged to reprint it.—Ed.

ANNEALING

Sir:

Will you please send me a copy of the series by Peter Payson on "Annealing of Steel?"

BRUCE B. KINNIE
1306 N. Rockton Avenue,
Rockford, Ill.

● The series was reprinted by Crucible Steel Co. of America, 405 Lexington Ave., New York 20, with which Mr. Payson is connected.—Ed.

BOUQUETS

Sir:

. . . and please give my kindest regards to Mr. Van Deventer and tell him I continue to get a big kick out of his weekly editorial.

J. G. LORRIMAN,
Manager
Eastern Steel Products, Ltd.,
Preston, Canada

Sir:

. . . To us, the weekly receipt of THE IRON AGE is an event, particularly, the weekly visit with Mr. Van Deventer.

F. I. DEGEN,
President
Babcock Mfg. Co.,
Leonardville, N. Y.

NE STEEL CHART

Sir:

Lieut. W. C. Wallin, USNR of the RINM office, Hamilton, Ohio, informs me that you have an NE Standard Steel Chart, showing all NE steels with chemical and physical properties and the SAE steels which correspond. I would appreciate one by return mail.

J. E. MCCOY,
Chief Draftsman
Cummins Engine Co.,
Columbus, Ind.

● The chart is being sent you, price 25c.—Ed.

"SPIRIT OF ENTERPRISE"

Sir:

J. H. Van Deventer's editorial of July 29 refers to Edgar M. Queeny's book, "The Spirit of Enterprise."

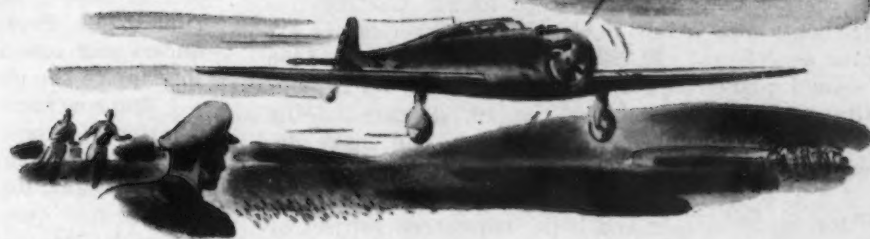
I should be grateful if you could inform me where this can be obtained in England.

W. ROBSON BROWN
Richard Thomas & Co., Ltd.,
47 Park Street, London, W.1

● The publisher, Chas. Scribner's Sons, 597 Fifth Ave., New York, informs us that copies are not on sale in England, but is sending you one from here, price \$2.—Ed.

PREVENTING **BRAKE FAILURE AT 20,000 FEET**

-Prevents Total Failure Here!



★ Offhand, you wouldn't think that a fighting plane could have brake failure at 20,000 feet. But, if brake control springs are improperly designed, brakes can lock during certain maneuvers at high altitudes—with disastrous results on landing.

Violent changes in temperature and sudden variations in atmospheric pressure have an effect on aircraft working parts, and must be considered by the spring designer. For, in a few minutes' time, these parts can be subjected to extreme variations—from tropical heat of 120° to the paralyzing cold of 70° below—from pressure at sea level to the rarefied atmospheres of ceiling heights.

In designing springs for aircraft applications, Muehlhausen research has successfully solved these problems. And for this reason alone, one prominent plane manufacturer* now specifies **ONLY** Muehlhausen Springs for the brake controls on its combat planes.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
817 Michigan Avenue, Logansport, Indiana

* name on request

Muehlhausen Springs are used by the majority of prominent brake manufacturers—for aircraft, automotive and industrial applications.



Leading product designers in every industry are consulting Muehlhausen Engineers to secure springs of lasting efficiency.

MUEHLHAUSEN SPRINGS



EVERY TYPE AND SIZE

This Industrial Week . . .

- **Ingot Output a Hard Blow at Axis**
- **Lack of Labor Hits Civilian Goods**
- **Electric Furnace Problem Adjusted**
- **Scrap Shortages Felt in New Areas**

SINCE Pearl Harbor around 163,000,000 net tons of steel ingots has poured out of America's steel mills, much of it destined to glint before Axis eyes. This week the roaring mills are producing a "blitz" of close to 1,800,000 tons, an all-time high mark, achieved despite half a dozen sporadic strikes. The national operating rate is estimated at 101 per cent, a gain of one point from last week.

Unceasing, too, is the demand for steel. Order books steadily have been growing more extended for principal products, and holes created by cancellations quickly are filled in. Bar mill schedules are solid into second quarter of next year on some items, certain mills can accept no more sheet tonnage until next June, cold finished bars particularly are sold out on an industry wide basis until next March, plate mills have more business than they can handle, and so on. New requirements are appearing regularly, the latest including steel for trucks, shovels, drums and motor parts.

WPB has allocated about 248,000 tons of steel, exclusive of castings, for construction of 15,983 new freight cars during the first nine months of next year, ODT announced last Friday. An interesting feature of this allotment is the return to the wider use of steel construction. Some of the equipment, including the box cars, hoppers and gondolas, will be all steel, except that the box cars will have wood lining. Castings requirements total about 40,000 tons. Deliveries are expected as follows: 10,122 cars in first quarter; 4456 in second quarter; 1405 in third quarter. WPB originally allotted material for the 10,122 cars in the fourth quarter, but construction lags will make deliveries impossible until the first quarter.

THE much abused and little understood subject of civilian requirements has been undergoing a subtle but major alteration in its position in recent months. The prospects for increased production of truly civilian items do not seem any brighter now than a year ago. But, now the obstacle is labor requirements and components, while a year ago the bottleneck was material.

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Therefore, while it may be true that there may be a relaxation in war requirements of certain basic materials, it does not necessarily follow that there will be a widespread resumption of civilian goods manufacture.

A marked easing of ferroalloys and many non-ferrous metals was evidenced in the tenth material substitutions and supply list, issued on Monday by WPB.

The Truman Committee is reported to be eyeing the termination of contract problem with special emphasis on inventories. A committee spokesman said on Monday that consideration is being given legislation to prohibit the inclusion in termination settlements made by the government with contractors of payments for more than 60 days' inventory, the maximum a contractor may have on hand under CMP regulations. It was declared the committee feels that many contractors hold stocks of materials greater than a 60 day supply. Meanwhile, the Truman Committee is pressuring the war agencies and Treasury Procurement to set up a property accounting scheme.

THE problem of providing business for electric alloy steel furnaces, hard hit by reductions in military needs just as considerable new capacity came into use and while consumers were buying much open hearth alloy steel, is being adjusted rapidly for the time being. Pressure has been exerted upon both producers and consumers to effect the transfer of much tonnage to the electric units.

Improvement was apparent last week in the disposition of excess steel ingots. Although good balance is difficult to maintain for any length of time, only a few thousand tons was without a user at the week's end. In first quarter, shipments to Lend-Lease will be cut back. One eastern company is reported supplying close to 25,000 tons of slabs per month to outside users.

Most stubborn bottleneck in the aircraft field, according to military officials, continues to be forgings, which are needed desperately in larger quantities in order that plane output can be lifted. Orders for forgings will be screened again in an attempt to aid suppliers. Meanwhile, aircraft officials still are encountering emergency situations, requiring quick changes in parts and materials, the result of discoveries made in combat. A current problem is said to be obtaining large quantities of stainless steel ignition wire in a hurry.

Additional steel making areas are beginning to experience shortages of steel scrap, largely because of the lack of manpower in scrap yards. The northern Ohio district is one of the areas now affected. There is no shortage of electric furnace grades, but the premium grade low phos material cannot be used by open hearts under existing regulations.

A campaign like the current drive to increase

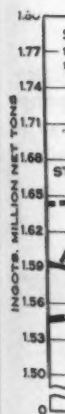
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U. S. reserves of iron and steel scrap is a well based venture for a variety of reasons, including the fact that a shooting war has only just begun. There is an important aspect to the present scrap situation that did not prevail with respect to the first drive one year ago. This is the attitude of the government regarding the termination of contracts. While it is not officially stated, it is known that some consumers feel that to fill their inventories to a higher level is a matter of national safety and that they should be given protection for buying above what their needs may be.

CANCELLATIONS of orders in the machine tool industry during the first seven months of this year averaged almost \$15,000,000 per month, members of the National Machine Tool Dealers Association were told in Chicago this week at their Fall meeting. Tell Berna, general manager of the association, emphasized the importance of legislation providing for prompt payment of termination claims and quick disposal of parts.

Last week brought elimination of the special tax amortization speed-up granted by Congress in 1940. This enabled corporations to write off the cost of new facilities in five years, and since the privilege was granted 27,000 necessity certificates had been issued for facilities valued at over \$500,000,000.

How coal production, vital to the continuance of high steel production, is affected by lower production per miner, absenteeism, manpower losses to the armed forces and to other industries, and other factors, is revealed by one large mining company, now producing 45,000 tons of coal per day instead of 55,000 tons as it did in 1942.

Reserve stocks held by steel makers are still low and any curtailment of mine output soon would be reflected in reduced production of pig iron and steel.

WHILE Washington wrestles with the problem of how to raise taxes to dizzy heights, a cry which will be welcomed by a wide section of the stunned public was put forth last week by Rep. Taber, Republican of New York. He said he be-

Kaiser to Make Electric Steel; Other Sidelights of Production

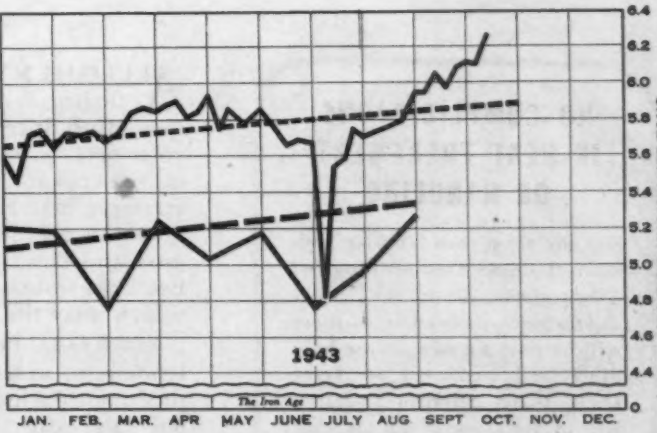
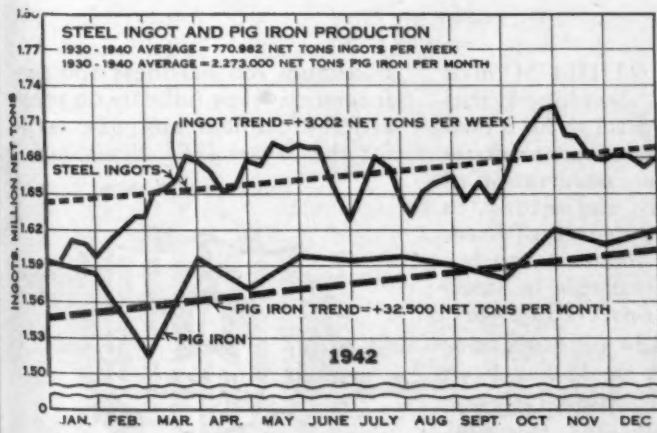
• • • It is understood the Kaiser steel works on the Pacific Coast will build and operate electric furnace facilities. This addition will help make Kaiser fully integrated and will gratify a long standing ambition. Presumably some of the steel will be made for sale, in the opinion of an authority at Washington . . . A large copper company is understood to be seeking to match a competitor's interest in magnesium with an acquisition of production facilities in the light metals field . . . It is reported that the Defense Plant Corp. \$28,000,000 tank armor plant located at Madison, Ill., will be converted to the production of heavy truck axles. The conversion, which will take approximately six months, will be under the supervision of Standard Steel Spring Co. of Pittsburgh . . . National Tube Co. and A. O. Smith Corp. have shared in the order for about 215,000 tons of steel pipe, to be used for a natural gas pipe line from Texas to West Virginia. Deliveries are to begin in December. National Tube Co. is reported to have received 300 miles, which will be made in seamless tubing, and the balance of 900 miles is said to have gone to A. O. Smith which is expected to fabricate its share from plates . . . Estimates of controlled materials requirements for first quarter of 1944 have been compiled and it is said that carbon steel will satisfy requirements within approximately 10 per cent, closer than ever before . . . Post-war plans of one truck company are rumored to include liberal use of aluminum, in an effort to save up to 1200 lb. per unit . . . One large munitions company alone has yearly requirements for 50,000 tons of chemical cast iron borings used as a reducing agent.

lieved \$4,000,000,000 might be saved from 1944 federal expenditures which are scheduled to hit the \$90,000,000,000 mark. He drew up a list of the savings (page 119), which he said could be made without in any way impairing the war effort or the efficiency of governmental operation.

Following the death of the Steel Recovery Corp. in Pittsburgh and in line with the decentralization policy of WPB, redistribution of excess and the steel will now be channeled through WPB regional offices, which can approve the sale of surplus steel for any use permitted by WPB regulations, regardless of quota or allotment. All future inventories of idle and excess materials are to be reported to WPB.

Steel ingot production during September at 7,488,978 tons was the highest for any 30-day month in history, the average tonnage produced per week exceeding average weekly production in all preceding months. New furnaces coming into production are primarily responsible for the increase in output.

The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 7	102.5	99.5	99.0	94.5	98.5	104.5	103.0	98.5	102.5	95.0	105.0	106.5	96.5	100.0
October 14	103.5	102.0	98.5	93.5	95.0	104.5	104.0	102.0	98.5	95.0	109.0	106.5	101.5	101.0



Ready Now FOR YOUR *Super* CUTTING JOBS ... *Super DBL* HIGH SPEED STEEL

NO COMPLICATIONS IN HEAT TREATMENT OR HANDLING

For any shop man familiar with the techniques used on tungsten cobalt steels, or on the 18-4-1 and tungsten-moly analyses, there will be nothing new in the handling and treatment of *Super DBL*. It also conforms to standard in the forms and finishes available, which include regular sizes of mill-treated tool bits and can be supplied from Allegheny Ludlum warehouse stocks, as well as distributors, in principal cities coast to coast.

ALLEGHENY LUDLUM mill technicians developed this new High Speed Steel to fill a dual role: first, to meet government requirements for the conservation of strategic materials; and second, to give you a higher degree of hardness and cutting stamina than has been previously available in steels which meet the conservation need.

Super DBL (a low-tungsten, molybdenum, cobalt steel) has been thoroughly tried and tested in service—it's ready to take on your heaviest-duty production work. Use it on hard, gritty castings—on heat treated alloy or stainless steels—on any rough and tough cutting job in the shop with full assurance of

maximum red hardness and performance. • For full data on properties, treatment and use, write for the "*Super DBL* Blue Sheet."

ADDRESS DEPT. 1A-10



Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-9074 . . . W&D

Four Billion Dollars Can Be Slashed From Record U.S. Spending, Congressman Declares

Washington

• • • The tocsin of additional taxes has sounded on Capitol Hill and the old familiar cries of "soak the rich," "retail sales tax," "higher corporation taxes," and many others are ringing through the halls of Congress.

The Administration has proposed a plan which is designed to raise \$10,500,000,000 additional revenue. This plan is now before the House Ways and Means Committee. The plan would take most of this money from heavier personal and corporate taxes.

Opposition from both sides of the political fence has been strong, the general belief being that the people cannot bear such a burden at this time. Chairman Doughton of the Committee, Democrat, North Carolina, a staunch Administration supporter, scorned the New Deal position as "utterly indefensible."

The opposition, both Democrat and Republican, has expressed a desire for the adoption of a 10 per cent retail sales tax, while the Republicans coupled this with a demand for drastic curtailment of Government expenditures. Some lawmakers feel that the Ways and Means Committee will pare the \$10,500,000,000 to about \$5,000,000,000.

Rep. Taber, Republican, New York, ranking Republican member of the House Appropriations Committee, has shown how the Treasury's \$10,500,000,000 program can be slashed by cuts in government expenditures, which will not impair the war effort.

Paulsen Spence, president of the Spence Engineering Co., Walden, N. Y., told the

committee last week that the excess profits tax on corporations puts a premium on inefficiency, and proposed that Congress allow any corporation with an invested capital up to \$1,000,000 to earn 10 per cent on its net sales without exacting an excess profits tax, renegotiation, or both.

As the committee meetings progressed it was evident that the sales tax proposals would be given the fullest consideration despite the Treasury's long standing opposition to such a tax.

Rep. Taber, long an advocate of retail sales tax and curtailment of government spending, recently said that the United States is now carrying the full financial load of the war and spending more money than our allies and enemies combined.

Mr. Taber, continuing, believed that it is time Congress took stock of the situation:

"Heretofore the Congress has given the President just about everything he has asked for. The time has come for Congress to stop, look and listen if we are to avoid national bankruptcy and economic chaos. The President being without practical business ex-

perience may not realize the seriousness of a situation that is all too apparent to the rest of us.

"The Federal expenditures in the fiscal year, 1944, will be approximately \$90,000,000,000. Of this huge sum, which staggers the imagination, I propose to show how more than \$4,000,000,000 may be saved without in any way impairing the war effort or the efficiency of governmental operation.

"There are three or four classes of Federal Expenditures. There are those wartime expenditures which even with the continuance of the war should be non-recurring at the present stage of operations—amongst these are barracks and quarters for soldiers and sailors, training camps, etc.; even temporary housing and offices in the District of Columbia; factories for war production; public works, such as docks, dry docks, wharves, shops, etc., in the Navy; engineering service, military construction for the

Army, the revolving fund for the War Shipping Board, being a capital fund, should not require more money; there should be a saving in the fiscal year, 1945, of at least \$2,000,000,000 in connection with the construction of new ships, present costs are running at the rate of upwards of \$4,000,000,000 and they should begin to taper off.

"I am satisfied that there can be a tapering-off in many of the military activities of the Army and that out of the enormous appropriations that have been made

SAVINGS WHICH U. S. CAN MAKE

... Here is the picture of savings in the fiscal year 1945 which certainly should be made, according to Rep. Taber.

Navy—

Yards and docks, barracks and training camps	\$1,500,000,000
Public works such as docks, shops, dry docks	1,500,000,000

Army—

Expediting production (building factories)	1,500,000,000
Engineer service	500,000,000
Military construction	500,000,000
Military posts	500,000,000

Miscellaneous—

Housing Agency	150,000,000
Community Facilities	75,000,000
Office of Economic Warfare	20,000,000
Office of Price Administration	25,000,000
Office of Civilian Defense	13,000,000
Office of War Information	10,000,000

War Shipping Board Revolving Fund

Labor and Federal Security (misc. items)	2,000,000,000
Interior Department	50,000,000
Conservation and Use Agricultural Lands	25,000,000
FSS Crop Production Loans	250,000,000
	40,000,000

	\$8,658,000,000
Estimated additional costs of Army	—4,000,000,000
	\$4,658,000,000

there should be turned back, but I shall not put those figures down because I could not be so sure of them as I am of these other figures.

"On the other hand, there will be some increase in expenditures because of more men in the Army involving about \$4,000,000,000.

"Everywhere one turns in the Government offices, one finds three to four people employed where one or two is all that is needed. The Byrd Committee, after an investigation, found that we could reduce our Federal employees by 300,000. That is a very conservative figure.

"In addition to this we should be able to reduce some of the military programs because we are now piling up large stocks of these things in warehouses and have reached the point where we do not need quite so much production in many things."

Representative Taber, a veteran legislator, is considered an expert on financial matters and his views of curtailment of Government spending are being considered by members of the House Ways and Means Committee in their effort to arrive at an equitable tax bill. Combined with a retail sales tax, which it is estimated would yield between \$5,000,000,000 and \$6,000,000,000, Mr. Taber's proposals would destine the Administration's program for the waste basket.

A Big Steel Center in Every State Urged By Senator; "Let's Start Now"

Washington

• • • Patrick J. McCarran, Senator from Nevada, Democrat and anti-court packing champion, proposes the mightiest steel expansion program in history.

The Senator is urging his colleagues to appropriate government funds to duplicate the steel industry's 90,000,000 tons of capacity in all of the states which are not favored by sizable steel plants. The Senator would not wait until the war is over to begin this ambitious program; he wants to "start right now."

Not only would the white-haired, rotund legislator from the West push the steel industry around, but he envisions a day when all industry will be relocated.

"The steel industry is basic," said the Senator profoundly. "Once steel comes to a state, all other industries follow."

Perhaps, the winds which blow over the vast expanses of his native state promote ideas of the grand kind. But the wind alone cannot be held solely

responsible for the acceptance of the Senator's ideas.

For last week a caucus of 50 members of the House of Representatives and 30 Senators listened to Mr. McCarran expound his theories with great enthusiasm. The Senator was wildly cheered when he rabbit-punched WPB.

WPB, the Senator said, has a "cramped and prejudiced viewpoint, and its officials are incapable of adopting a viewpoint uncolored by their own interests or by the interests of those with whom they have been associated in private industry."

Mr. McCarran told THE IRON AGE that the United States Steel Corp. controls the WPB Steel Division. This notion appears to be widely accepted by others of Mr. McCarran's turn of mind, although United States Steel has loaned only three or four men to WPB and the largest representation is from 20 to 30 other companies.

Mr. McCarran does not think his plan is against the ideas of free enterprise. When asked his opinion of the National Resources Planning Board's proposal to institute government ownership of all basic metals' industries, he said:

"That's communism. I am in favor of free enterprise."

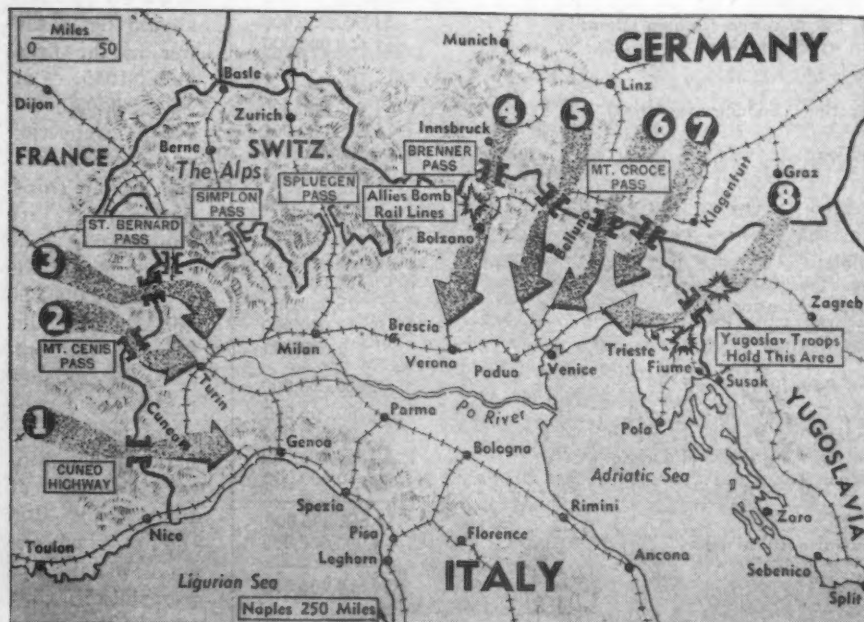
Actually the Senator's scheme is more grandiose and extravagant than was the rather elaborate proposal of the NRPB which recommended total steel capacity of a mere 120,000,000 tons. The Senator would raise the ante by 60,000,000 tons—the difference between his total and 180,000,000 tons, which he proposed by doubling the present capacity.

However, Mr. McCarran sees no similarity between his ideas and the thought that it would be fine if Congress would prohibit the growing of oranges in Florida and make California the only orange-growing state. A companion to this easily accomplished legislation would be moving the textile mills of the South to New England. The Senator did not say he favored these moves.

While admitting that the government would put up the money to finance these new mills, the Senator stood firmly in favor of free enterprise. He thought private business should run these plants.

Conceding that building all this fantastic new steel capacity would

HITLER'S SUPPLY PROBLEM: Hitler has eight potential routes of supply to bolster his retreating armies in Italy. But he is meeting powerful interference on two important routes: Allied planes are blasting rail and road links south of the Brenner Pass, while Yugoslav partisan armies are busy fighting the Nazis in the Northeast corner of Italy. The map shows the routes through the mountains between Italy and Germany.



reduce the sales of the rest of the industry, Mr. McCarran did not indicate that he had given much thought to the problem of compensating the companies for their loss of markets, or stockholders for their losses in investments. When asked about the markets for all this new steel, Mr. McCarran's thoughts turned to the reconstruction of Europe and Russia.

"This war is not going to end the way the last one did," said the Senator confidentially. "It is going to have a different kind of an ending."

The question had been asked what should be done with all of the new capacity in view of the reports that 80 per cent of the steel capacity will be freed as soon as the European war ends.

"Oh, I think you underestimate the use of steel in the future," said the Senator. "The future will be a steel age and the people should be able to get it easily."

"Don't you think that the people of the state of Nevada should be able to get steel from the high magnetic ores in their state?" queried the Senator. It was gravely agreed that it would be fine if such were the case.

Mr. McCarran thinks that the great decentralization or "recentralization" should take place in spite of the likelihood of \$50,000,000,000 to \$100,000,000,000 worth of surplus war goods which will overhang civilian markets after the war.

"Don't you think the steel companies will vigorously oppose this scheme?" it was asked pointing out that extensive post-war export steel markets would be impossible without heavy governmental subsidies of price and credit and that much of the steel industry could be expected to oppose subsidies.

Mr. McCarran agreed that the steel industry would not agree with him and said that he too did not favor subsidies for the industry. He seemed a trifle surprised that it would be necessary to subsidize both privately produced and the new governmentally financed steel. He indicated he did not know that foreign governments subsidize their steel industries.

According to WPB reports, the Southern steel-hungry states have joined the Western states, in the decentralization drive.

Last week, with a few exceptions, the Texas Congressional delegation called on WPB to urge permission to construct a \$60,000,000 steel mill at Daingerfield, Tex., with RFC funds. WPB refused to approve.

The Lone Star Steel Co. was loaned

\$20,000,000 by RFC more than a year ago to build a blast furnace at Daingerfield. The officials of the Steel Division at the time disapproved but WPB higher-ups gave it the OK after much political opportuning by Texans.

The reason the furnace was not approved by the Steel Division is that there is no market for the iron. WPB approved the furnace however because the board was persuaded that it could be used as a standby in the event anything happened to Great Lake ore supplies.

Reported administration backing of the proposition to make every section of the country self-sufficient so far as steel is concerned gained some significance at a hearing held recently before the House small business committee. Just what constitutes a sec-

tion of the country remains vague.

Rep. Wright Patman, Democrat, of Texas, in whose district the Daingerfield project is, played Tambo to Jesse Jones's Mr. Bones at the hearing.

"... There are about 32 different states that have valuable iron ore, I believe," asked Mr. Patman. "Would it not be a good time for us to begin to think about letting each section of the nation make itself self sufficient in regard to steel and other basic metals as far as possible?"

"Naturally, that would appear to be desirable. On the question of steel, a great deal of the steel facilities are, we will say beginning at Cleveland going west, particularly around the Chicago area. We built a very big plant in Utah. It cost about \$190,000,000," replied Mr. Jones.

Reinforcing Bars, Once Cut Back, Boosted.

Pittsburgh

... After being shoved around roughly and restricted greatly, for almost a year, concrete bars apparently are going to get a new deal. A letter sent to the Concrete Steel Reinforcing Institute recently by Harlow Lewis, chief of the WPB materials control branch, states, "Reinforced concrete construction is considered a good choice for much of the construction that is now being built provided that either metal forms or used form lumber are used for the construction."

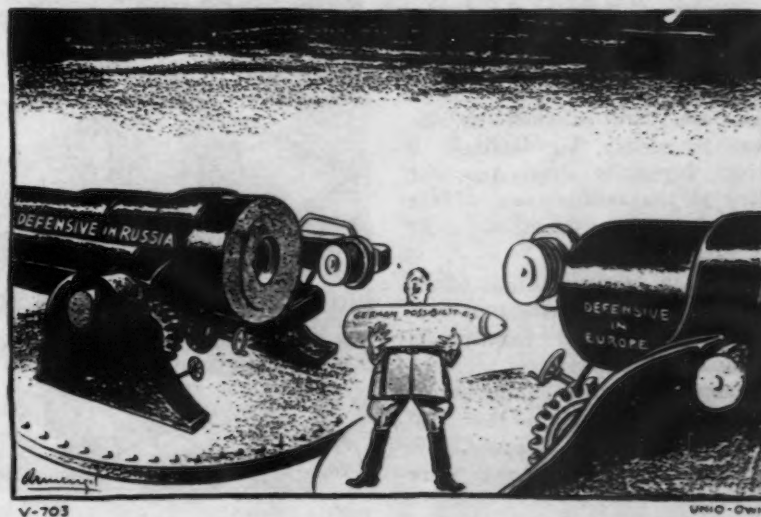
The substantial cut back in concrete bar output, which is said to have been taken to conserve steel for other uses, resulted in a decline in production of concrete bars for sale of approximately 73 per cent this year, from 1941

production. Mr. Lewis warned, however, that too often, when reinforced concrete has been determined by the designer, too little consideration is given to the availability of metal forms,

It is said that for rental purposes in principal cities there are 9,506,700 sq. ft. of removable steel forms for concrete joist construction—1,203,000 sq. ft. of removable steel forms for flat slabs—727,500 lin. ft. of steel column forms of varying diameters—1,422,000 sq. ft. of used wood panel forms and 721,500 ft. of fixed and adjustable shoring.

Music to the ears of concrete bar makers, as well as engineers, is the statement of Mr. Lewis that "the supply of reinforcing bars is sufficient to meet all requirements."

DILEMMA



Gray Iron Founders Hear Boykin Assert Still More Steel Is Needed

Cincinnati

• • • Bedeviled by critical shortages of manpower, rising costs and difficulties in obtaining necessary materials, the Gray Iron Founders Society, Inc., convened here Oct. 5 and 6 to try to get answers to vexing questions. They found few answers. Those that were found related directly to their own practices of management, sales research and development, and costs systems, but the problems that really worried these founders were not completely answered.

The argument of utilization of low-grade ores through the sponge iron process was brought up by Rep. Frank Boykin, of Alabama, chairman of the House committee investigating iron and steel shortages. Boykin mentioned that a \$2,000,000 appropriation had been granted to develop the sponge iron process through the co-operation of governors and congressmen of the various states. He reported, very optimistically, that the Republic Steel Corp. sponge iron plant would be in operation by January, 1944, and that there were three more plants for making sponge iron under construction, two in Texas and one in California.

Boykin made a direct accusation that big steel companies were misleading the public through statements that the industry is producing all the steel needed. He estimated that production was about 25,000,000 tons short of annual requirements.

In line with the current steel shortages, the representative from Alabama drew an interesting comparison. On one hand he accused industry, the steel industry in particular, of not doing the job it claims is being done and on the other hand he lauded American ingenuity for the remarkable war production job accomplished. It is apparent that in his mind these factors are two distinct things, whereas in reality, big business is American ingenuity since American industry is the businessmen of the nation. Such inconsistencies could hardly escape notice.

J. L. Carter, cost consultant of the Society and formerly associated with the OPA, admonished foundrymen generally for their poor cost accounting systems. Of an OPA survey covering 2500 foundries, he stated that 1500 either guessed at profits or based their estimates on cost systems that were

Gray Iron Society Elects New Officers

President, Walter L. Seelbach, vice-president, Forest City Foundries Co., Cleveland; vice-president, H. L. Edinger, vice-president, Barnett Foundry & Machine Co., Irvington, N. J.; secretary, F. H. Rayfield, vice-president Potter & Rayfield, Inc., Atlanta, Ga.; treasurer, George Walton, president, Madison Foundry Co., Cleveland; executive vice-president, W. W. Rose, 1341 Connecticut Ave., N.W. Washington.

so faulty, as to be practically useless. The 4 per cent average profit from 1936 to 1939 for the industry could easily have been 8 per cent if all foundries had respectable cost systems. In the survey, 25 per cent of the industry showed a loss.

During 1942, 30 to 40 per cent of the gray iron foundry output went into machine tools and unless conversions have taken place or are imminent, foundries will find themselves in a predicament as far as sales outlets are concerned. Mr. Carter's suggestions were highly practical and well received by the foundrymen at the meeting.

Likewise, the remarks by H. L.

FOR INGOT HANDLING: This massive tong, constructed by Heppenstall Co., Pittsburgh, has a lifting capacity of 80 tons. It was designed specifically for handling ingots, has an opening 69-in. wide and weighs 12,489 lb.



Creps, sales engineer of Frank Foundries Corp., Moline, Ill., were directed toward practical helps for the foundryman in the near future. Speaking on the determination and development of gray iron markets, Mr. Creps' talk was specific and not filled with elaborate unworkable theories.

Brig. Gen. W. C. Rose, chief of executive services of the WMC, painted a somewhat gloomy picture for the foundrymen. He stated that essential war production industries will need 2,000,000 additional workmen during the next six months, plus those that must be replaced because of induction into the armed services. The major part of this requirement will have to be made up of women.

From the standpoint of manufacturers' help supply, all of the troubles of the past three years will re-occur when the draft of fathers gets under way. Again, Manning Tables and Replacement Schedules will have to be used.

Senator James E. Murray, from Montana, speaking of his activities as head of the Senate committee on Small Business, stated that he was "shocked to learn that in recent months conditions have become so critical in your (the foundry) industry as a result of indiscriminate drafting of skilled and unskilled labor that 16-year-old boys had to be pressed into service." He took the War Manpower Commission to task for its dereliction in the performance of its duties as to ignore the importance of the gray iron industry by permitting the riddling of its ranks of workers. Consequently, he said, if the situation does not improve, the Senate Committee on Small Business will find it necessary to institute an investigation.

Sen. Murray continued his talk, touching superficially on the OPA price structure and its discrimination against small business, a classification into which he apparently lumped all foundries. Monopolies, bureaucracies and the termination of contracts also came up for discussion. He claimed that it was the desire of the Small Business Committee of the Senate to decentralize over-expanded industries, and governmental agencies have been generous with big industries and harsh with small companies. Senator Murray remarked that he had introduced a bill relative to the termination of war contracts, the hearings on which will start in about a week. One object of the bill will be to insure that demobilization of great war industries does not work to the disadvantage of American small business.

Excess Orders Long Foreseen, WPB Says

Washington

• • • Problems similar to the present flat rolled situation in steel under CMP were foreseen by WPB officials when the plan was first devised, a WPB spokesman said recently.

It was recognized at that time that there was a possibility that orders for some product might appear in volume greater than industry's capacity for producing that product even when pushed to the highest output level. CMP was developed on the theory that finishing facilities were sufficiently flexible to permit the designing of production directives to match the demand for various products.

This is what the Steel Division has done in scheduling approximately 150,000 tons of plates in excess of 105 per cent of expected production directives to cure a temporary situation. The same thing has been done with about 100,000 tons of sheet.

If cancellations do not take care of the overordering it was pointed out that any carry-over would only amount to about four days' rolling which delay would not be noticeable to any plate consumer or affect the progress of any agency program. Since the expected production of plates during the fourth quarter is approximately 3,500,000 tons, it can be seen that the excess order tonnage amounts to about 4.3 per cent of the total quarter's production.

It was determined during the writing of CMP that if one product became tight, it would have to be handled by one of the following methods, depending on the circumstances:

If the product deficiency could be relieved within a comparatively short time by relatively minor mill changes or by a short term expansion program the additional tonnage would be handled temporarily by increasing the overload on the mills so that all claimants would share alike in resultant delivery delays.

If the product shortage could not be relieved within a short time, but would involve a long term expansion program of six months to a year, it would be necessary to work out allocation methods whereby the Requirements Committee would determine to which agencies and which programs the available tonnage should be shipped during the time involved in the completion of new facilities.

The first of the two methods was decided upon by the Steel Division because the plate and sheet shortage can be relieved in a short time. The second method was decided against be-

cause the plate mill program is nearing completion.

If the second method had been adopted a scheme of total allocation could not be put into smooth operation for two or three months and would involve dislocation of other products required for use with plates and sheets.

U. S. Steel Ships 1,664,577 Tons Finished Steel in Sept.

• • • Shipments of finished steel by U. S. Steel Corp. subsidiaries during September totaled 1,664,577 net tons, compared with 1,704,289 tons in August and 1,703,570 tons in September, 1942.

For the year to Oct. 1, shipments were 15,069,644 net tons, against 15,761,476 in the same part of 1942.

Ingot Output in September Sets 30-Day Record

YEAR 1943

Production of Open Hearth, Bessemer and Electric Steel Ingots, and Steel for Castings. Source: American Iron & Steel Institute

Based on Reports by Companies which in 1942 made 98.3% of the Open Hearth, 100% of the Bessemer and 87.6% of the Electric Ingot and Steel for Castings Production

PERIOD	ESTIMATED PRODUCTION—ALL COMPANIES						Calculated weekly production all companies (Net tons)	Number of weeks in month		
	OPEN HEARTH		BESSEMER		ELECTRIC				TOTAL	
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity			Net tons	Percent of capacity
January.....	6,576,589	97.8	478,058	85.9	369,395	95.4	7,424,042	96.8	1,675,856	4.43
February.....	6,033,674	99.3	447,843	89.1	344,532	98.6	6,826,049	98.5	1,706,512	4.00
March.....	6,785,295	100.9	503,673	90.5	381,219	98.5	7,670,187	100.0	1,731,419	4.43
1st Quarter..	19,395,558	99.3	1,429,574	88.4	1,095,146	97.5	21,920,278	98.4	1,704,532	12.86
April.....	6,509,812	99.9	481,810	89.4	382,532	102.1	7,374,154	99.3	1,718,917	4.29
May.....	6,664,298	99.1	483,024	86.8	398,057	102.9	7,545,379	98.4	1,703,246	4.43
June.....	6,188,857	95.0	453,599	84.1	384,645	102.6	7,027,101	94.6	1,638,019	4.29
2nd Quarter..	19,362,967	98.0	1,418,433	86.7	1,165,234	102.5	21,946,634	97.4	1,686,905	13.01
1st 6 months..	38,758,525	98.7	2,848,007	87.6	2,260,380	100.0	43,866,912	97.9	1,695,667	25.87
July.....	6,516,387	96.2	466,288	90.6	393,342	94.6	7,376,017	95.7	1,668,782	4.42
August.....	6,669,944	98.3	484,957	94.0	407,224	97.1	7,562,125	97.9	1,707,026	4.43
September....	6,617,102	100.9	480,635	96.4	391,241	96.6	7,488,978	100.4	1,740,761	4.28
3rd Quarter..	19,803,433	98.5	1,431,880	93.6	1,191,807	95.9	22,427,120	98.0	1,708,082	13.13
9 months....	58,561,958	98.6	4,279,887	89.5	3,452,187	98.5	66,294,032	97.9	1,699,847	39.00

Note—The percentages of capacity operated are calculated on weekly capacities of 1,518,621 net tons open hearth, 125,681 net tons Bessemer and 87,360 net tons electric ingots and steel for castings, total 1,731,662 net tons; based on annual capacities as of January 1, 1943 as follows: Open hearth 79,180,880 net tons, Bessemer 6,533,000 net tons, electric 4,534,980 net tons. Beginning July 1, 1943, the percentages of capacity operated are calculated on weekly capacities of 1,531,789 net tons open hearth, 116,494 net tons Bessemer and 94,667 net tons electric ingots and steel for castings, total 1,742,950 net tons; based on annual capacities as follows: Open hearth 79,867,450 net tons, Bessemer 6,074,000 net tons, Electric 4,935,960 net tons.

YEAR 1942

PERIOD	ESTIMATED PRODUCTION—ALL COMPANIES						Calculated weekly production all companies (Net tons)	Number of weeks in month		
	OPEN HEARTH		BESSEMER		ELECTRIC				TOTAL	
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity			Net tons	Percent of capacity
January.....	6,322,215	95.3	490,874	86.0	299,017	94.2	7,112,106	94.5	1,605,442	4.43
February.....	5,785,918	96.6	453,549	88.0	273,068	95.2	6,512,535	95.9	1,628,134	4.00
March.....	6,572,930	99.0	493,191	86.4	325,990	102.7	7,392,111	98.2	1,668,648	4.43
1st Quarter..	18,681,063	97.0	1,437,614	86.7	898,075	97.4	21,016,752	96.2	1,634,273	12.86
April.....	6,345,133	98.7	454,834	82.2	321,324	104.5	7,121,291	97.7	1,659,975	4.29
May.....	6,595,440	99.4	453,938	79.5	333,200	104.9	7,382,578	98.1	1,666,496	4.43
June.....	6,239,674	97.1	452,528	81.8	323,100	105.1	7,015,302	96.3	1,635,269	4.29
2nd Quarter..	19,180,247	98.4	1,361,300	81.2	977,624	104.8	21,519,171	97.4	1,654,409	13.01
1st 6 months..	37,861,310	97.7	2,798,914	83.9	1,875,699	101.1	42,535,923	96.8	1,644,218	25.87
July.....	6,345,315	95.7	453,686	79.6	345,957	96.6	7,144,958	94.5	1,618,506	4.42
August.....	6,414,637	96.5	467,293	81.8	345,725	96.3	7,227,655	95.4	1,631,525	4.43
September....	6,286,855	97.9	437,961	79.4	332,703	95.9	7,057,519	96.4	1,648,953	4.28
3rd Quarter..	19,046,807	96.7	1,358,940	80.3	1,024,385	96.3	21,430,132	95.4	1,632,150	13.13
9 months....	56,908,117	97.3	4,157,854	82.7	2,900,084	99.4	63,966,055	96.3	1,640,155	39.00
October.....	6,750,829	101.5	461,897	80.9	366,788	102.2	7,579,514	100.0	1,710,951	4.43
November....	6,371,750	99.0	458,469	82.9	349,593	100.5	7,179,812	97.8	1,673,616	4.29
December....	6,471,261	97.6	475,204	83.4	358,075	100.0	7,304,540	96.6	1,652,611	4.42
4th Quarter..	19,593,840	99.4	1,395,570	82.4	1,074,456	100.9	22,063,866	98.2	1,679,137	13.14
2nd 6 months..	38,640,647	98.0	2,754,510	81.3	2,098,841	98.6	43,493,998	96.8	1,655,653	26.27
Total.....	76,501,957	97.9	5,553,424	82.6	3,974,540	99.8	86,029,921	96.8	1,649,979	52.14

Note—The percentages of capacity operated in the first 6 months are calculated on weekly capacities of 1,498,022 net tons open hearth, 125,911 net tons Bessemer and 71,682 net tons electric ingots and steel for castings, total 1,695,622 net tons; based on annual capacities as of Jan. 1, 1942, as follows: Open hearth 78,107,260 net tons, Bessemer 6,721,400 net tons, electric 3,737,510 net tons. Beginning July 1, 1942, the percentages of capacity operated are calculated on weekly capacities of 1,500,714 net tons open hearth, 128,911 net tons Bessemer and 81,049 net tons electric ingots and steel for castings, total 1,710,674 net tons; based on annual capacities as follows: Open hearth 78,247,230 net tons, Bessemer 6,721,400 net tons, Electric 4,225,890 net tons.

Loss in Coal Output of 10,000 Tons Per Day Cited by One Mining Firm Alone

Pittsburgh

• • • The Koppers Coal Division, Eastern Gas & Fuel Associates, is producing 45,000 tons of coal per day instead of 55,000 tons as it did in 1942. This loss of approximately 10,000 tons per day of production is partly accounted for by a considerable loss of men to the armed forces, to other industries, and by men failing to report for work regularly. It is also caused by the fact that there is a great deal less coal loaded by some individual miners. These facts were the nub of a letter mailed last week to each of the division's 15,000 employees by L. C. Campbell, general manager.

Absenteeism must be eliminated and coal production substantially increased to keep the flow of war materials to American troops, said Mr. Campbell. Attached to the letter sent to the employees was a cartoon entitled "Idle Tools Help Hitler." The company urged each individual miner to stay on the job day by day, with the determination to produce at least two more tons daily.

The letter, recent statements by Harold Ickes, and a hint in the United Mine Workers' Journal that individual efficiency has been affected, bear out the contentions made by THE IRON AGE Sept. 16. At that time it was claimed that output had been affected among other things besides absentee-

ism, manpower shortage, etc., by "no contract jitters." In recent weeks, there has been no change in this situation. While no official strike is expected by end of this month, when Mr. Lewis' "truce" runs out, there is still the possibility of isolated outlaw stoppages. More serious, however, is the continuation in the downward trend in the tons of coal produced per man per day at many mines.

Also serious, from a steel standpoint, is the fact that some large steel companies have only a few days' supply of coal ahead of their by-product ovens. The Department of Interior, Bureau of Mines bulletin, showing preliminary figures for August, indicates that by-product coke ovens had 27 days' supply on hand. This is an overall figure, however, and does not disclose the position of some of the larger plants which are far from that comfortable position.

It is believed that the giant Clairton by-product plant of Carnegie-Illinois, which feeds coal to the by-product plant supplying United States Steel Corp. blast furnaces in the Pittsburgh district, has less than five days' supply. A coal mining stoppage of a few days would force the Corporation plants in the Pittsburgh district to reduce iron output and, hence, steel production.

The Corporation was never able to

build up its supplies at Clairton after the last strike. Furthermore, absenteeism and the lack of a settlement in the mine controversy, have affected daily output. The need for coke also forced the company to transfer some of the Clairton coal to beehive plants, where it was urgently needed to produce blast furnace coke. This action further cut the supplies ahead of the Clairton by-product plant. Jones & Laughlin Steel Corp. is also said to have only a short supply of coke ahead of its by-product oven.

As pointed out in this magazine recently, there seems to be no solution to the coal production outlook until some definite settlement is made on the mine union wage controversy.

Lincoln Decries Tax Law Effects; Urges Incentives

Cleveland

• • • Principal views on the new tax bill to be submitted to Congress as expressed by J. F. Lincoln, president, the Lincoln Electric Co., Cleveland, stated in part that free enterprise upon which our country became great, is now being eliminated by the bureaucratic policy of the Treasury Department. "A further destructive effect of this policy is the creating of a caste system covering all American workers," he said. Other quotes included:

"Penalizing incentive cannot do otherwise than eliminate American efficiency of industrial production.

"Our company's incentive system has increased production to four times as much per man hour comparable to organizations without incentives. Because of our incentives we are fined \$1,600,000.

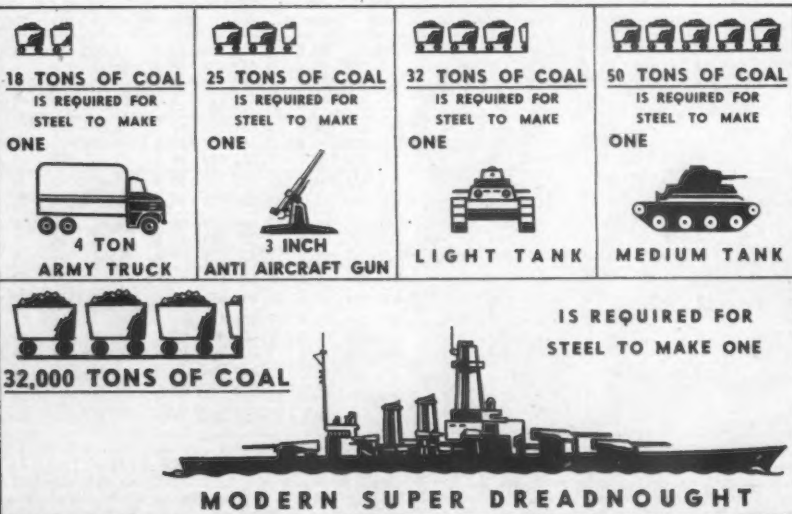
"The new tax law must encourage productive efficiency rather than kill it."

Lincoln Payment Set

• • • James F. Lincoln was notified Oct. 11 by James Forrestal, Undersecretary of the Navy, that a direction that the company pay \$3,250,000 as excessive profits on 1942 war contracts would be issued soon by the Navy Department.

The figure, Mr. Lincoln explained, was reached by the Navy Price Adjustment Board during renegotiation of Army and Navy contracts filled by the company during 1942. Mr. Lincoln refused to concur in the board's decision.

ALL STEEL FOR WAR STARTS WITH BITUMINOUS COAL



GRAPHIC BY PICK-S

Berna Warns Tool Builders About Termination; Asks Quick Settlement Law

Chicago

• • • "One of the most serious problems facing the government," Tell Berna, general manager of the National Machine Tool Builders Association told members at the forty-second annual meeting here this week, "is the problem of termination of contracts." This problem is destined to become progressively more serious as the war approaches an end, and the troubles thus far will be minor. The imperative need is for a far simpler procedure than has thus far been developed. Cancellations in the machine tool industry during the first seven months of this year have averaged almost \$15,000,000 a month, and builders cannot continue to accept cancellations "no charge," he said. Otherwise, they would risk being caught with huge inventories of parts and sub-assemblies for which there will be little or no market after the end of the war.

While all of the armed services are reviewing cancellation procedures and working out policies and the Division of Procurement's policy of WPB is working on a "termination article" which is hoped will be a standard for all branches of the government, about \$10,000,000 worth of orders a month (currently) are on PD-1-A priorities or the new WPB 541. The settlement of these orders on cancellation depends upon the terms of sale which the customer accepted or the terms on his order if the builder accepted them. This simply calls for caution on the part of the builder. The remainder of the machine tool orders, bearing PD-3-A certification now known as WPB-542, are for the government and it is with reference to the cancellation of these orders that difficulties will arise.

In cases where the builder sells direct to the government and is the prime contractor, government stipulations are important. In cases where the builder sells to a prime or subcontractor, however, the situation is more complex. There is a question whether or not, if the customer has not put the government stipulations on cancellations on the purchase order, the cancellation on such orders is a matter between the builder and the customer. However, the builder is much more interested in reaching a prompt settlement, one in which the customer can in turn arrive at a set-

tlement with his customer and with the contracting officer. Often a customer in placing a PD-3-A order includes the government cancellation clause. In this case the matter must be checked since a cancellation clause in cost-plus-fixed-fee contract doesn't apply to a fixed price supply

contract. These difficulties, as well as many others, Mr. Berna outlined to the machine tool builders and offered some suggested solutions to the problem.

Mr. Berna said that remedial measures to protect a supply must be taken very soon. The standard termination article might provide that sub-contractors may elect to negotiate direct with the contracting officer and make no charge against the customer.

[CONTINUED ON PAGE 184]

USW Move for Incentive Pay Rumored

Chicago

• • • Responsible labor officials in close touch with policy-making of the United Steelworkers of America (CIO) report that a possible proposal for an industry-wide incentive plan is "in the air" despite denial by union headquarters that any specific plan is being considered and disclaimer by company officials of knowledge of such a movement. The proposal presumably would be unveiled following final

disposal of the coal wage differences.

Even if the United Mine Workers lose out entirely on their plea for increased wages, the steel industry incentive plan might still be a live issue. It is pointed out by the labor informants that whereas wage stabilization places two strikes on any attempt to alter upwards basic wage rates, approval can more readily be secured of incentive plans which do not increase unit costs. Skepticism is voiced by company representatives that an industry-wide incentive wage plan could be devised which would not raise unit costs of steel production, for the network of incentive plans of limited scope now enmeshing most individual wage agreements removes much of the slack necessary if unit costs were not to be raised.

Insistence that such a plan is being discussed comes from a union source whose close contact with United Steelworkers' policy leaders is thoroughly acknowledged. Nevertheless, when another responsible official at union headquarters was confronted with the report, he told THE IRON AGE that there is not now any specific proposal to provide an industry-wide incentive plan for steel.

It has been taken for granted that if outright wage concessions were secured and approved by the United Mine Workers, the barrier would be sprung for steel and other industry union groups to race for higher pay for their members. The official union stand so far has hinged on the presidential promise that cost of living would be rolled back, with labor promising to hold in abeyance wage demands if the roll-back were achieved.

Philip Murray, CIO president, has been able to take this patient attitude to some extent because of increased take-home earnings afforded steel industry workers by adoption of the 48-hr. week.

Strikes Still Hurt Steel

• • • Fisticuffs between a Negro woman employee and a waitress started a strike of 200 at the Gary coke plant of Carnegie-Illinois Steel Corp. last week. Nine hundred eighty-nine coke ovens were halted for six hours and a daily loss of 13,400 tons of coke threatened.

Six hundred workers of the Buffalo Forge Co. walked off the job last week because the WLB had not acted on a dispute involving renegotiation of a USW contract. War production was affected.

Republic Steel Corp.'s sheet and strip mill in Cleveland suffered a strike of 900 workers causing the loss of 5000 tons of ships plate production as a result of a walkout started by the exodus of 13 foremen protesting the appointment of a new foreman.

Two mid-West metalworking war plants also suffered minor work stoppages. Forty-five out of 450 men struck at Warner Gear Co., Muncie, Ind., and a department of Young Radiator Co. Racine, Wis., walked out temporarily.

Cranemen and hookers of Carnegie-Illinois' south works merchant mill in Gary walked out for a full shift last Friday. The flash walkout resulted from a dispute among steel checkers on Thursday.

Revised Reg. 1 Alters SO Procedure; Changes Acceptance and Delivery Rules

Washington

••• A revision of CMP Regulation No. 1, revising the small order procedure; making provision for tentative acceptance of authorized controlled material orders; modifying rules relating to time for delivery of authorized controlled material orders and making minor changes of a formal nature, was announced by the WPB last week.

The definition of "a small order" has been modified to include delivery orders for Class A products placed with manufacturers where the amount of any controlled material required to fill the order does not exceed 3 tons of carbon steel (including wrought iron), 1200 lb of alloy steel, or 300 lb of copper and copper base alloys or 500 lb of aluminum per quarter.

Only prime consumers who have received authorized production schedules from a Claimant Agency or WPB, or secondary consumers who have received authorized production schedules from prime consumers or from other secondary consumers may use the small order procedure to obtain Class A products needed as production materials. The amendment points out that in some cases Claimant Agencies may be permitted to use the small order procedure.

In placing small orders, persons do not have to make allotments—and, therefore, do not have to show any allotment number or quarterly design-

nation on their orders. They merely endorse their orders with the symbol SO, the preference rating assigned to their production schedules, and the certification set forth in CMP Regulation 7 or CMP Regulation 3. They do not have to account for controlled materials purchased to fill such orders and do not need to make any deduction from their own allotment accounts, since they are not required to make an allotment. Persons filing applications for allotments need not make adjustments for controlled materials required to make Class A products which they buy under the small order procedure.

In using the small order procedure, a purchaser of Class A products may not order from all his suppliers more of the same Class A product for delivery during any calendar quarter than can be made from the quantities of controlled materials which define the small order limits. Purchasers may place small orders for delivery in any one calendar quarter for any number of different Class A products provided the amounts of controlled materials involved are within the defined limits.

In cases where the manufacturer has used the small order procedure, believing his total requirements for the product he is ordering during the quarter will be within the small order limits, and later discovers that due to unforeseeable circumstances his total

requirements for the product during the quarter will not be within the small order limits, he may still use the procedure, but must charge the allotment account with the total quantity of controlled materials needed to fill all small orders for the product to be delivered to him during the quarter. If, in such a case, the manufacturer does not have enough controlled materials in his allotment account to cover all of his small orders for the product, he must not use the small order procedure to buy an additional quantity, but may apply for an additional allotment to make up the difference.

Manufacturers of Class A products who receive small orders may obtain controlled materials to fill them by endorsing their purchase orders with (1) the allotment symbol, SO, and (2) the usual certification. Such an order is an authorized controlled material order. No quarterly designation or preference ratings need be shown on such orders. They must show the date or month when the delivery of controlled materials is needed, either for the production of the product ordered under SO procedure or to replace controlled materials in inventory which have been used for such purpose.

Manufacturers using controlled materials from inventory to fill small orders may place authorized controlled material orders endorsed with the symbol SO, calling for delivery of controlled materials after the small orders were delivered to the customer. They may use the SO symbol and extend their customers' ratings to get Class A products needed to fill small orders. Small orders for controlled materials may be combined, even though the total amount of controlled materials to be ordered for the production of Class A products is greater than the amount specified in the definition of a small order, but when they are so combined, the controlled material supplier should be notified by an endorsement of the purchase order for controlled materials, reading substantially as follows:

"The Class A products covered by this purchase order represent the combined requirements to fill SO orders received by me."

Class B products and other controlled materials required to fill small orders may be ordered for delivery at the time and in the quantities necessary to meet delivery dates specified on the small orders subject to the

LARGEST MOLYBDENUM MINE: Some of the equipment of the Climax Molybdenum mine is shown at the foot of Mount Bartlett in central Colorado. In 1940 the mine, largest of its kind in the world, produced 72 per cent of the global supply of the critical metal.



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Write for Bulletin No. 111

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inventory limitations set forth in Priorities Regulation No. 1.

Manufacturers of Class A products must keep records showing the amount of controlled materials ordered by use of the SO symbol, and production records must be accurate enough to show that the quantities of Class A products produced to fill small orders are reasonably related to the amount of controlled materials bought by the use of the SO symbol.

On the other hand, manufacturers of Class A products do not have to furnish their customers with bills of materials, applications for allotments, or equivalent information as to the amount of controlled materials needed to fill any particular small order.

The amendment deletes the provision in CMP Regulation 1 requiring that where a Claimant Agency authorizes a production schedule permitting production of Class A products in different quantities from the quantities called for in the related contract between the Claimant Agency and the prime consumer, the lesser of the two quantities shall govern. As a result of eliminating this provision the authorized production schedule governs.

Prior to the Amendment of Oct. 4, 1943, a controlled materials producer was prohibited from filling an order if, after accepting it for delivery in a given month, it developed that he could not make delivery either in that month or the following month. In such a case the producer was required to report the facts to his Controlled Materials Divisions and could only fill the order if directed to do so by the WPB. Direction 16 relating to steel, and Direction 23 relating to aluminum, were issued to vary this rule. By the amendment, this prohibition is deleted so that after having once accepted

an order for delivery in a particular month the controlled materials producer is required to fill it ahead of orders accepted for later delivery even though, due to unforeseen contingencies, the producer cannot make delivery in the month originally promised. It is contemplated that Direction 16 will be revoked. Direction 23 will, however, be continued as is indicated in the amendment.

The amendment also specifies that when a producer finds he is going to be unable to deliver an authorized controlled material order on the established delivery date, he must promptly advise his customer of the approximate date when delivery can be scheduled, and keep his customer advised of any changes in that date.

If a controlled material producer is unable to accept an authorized controlled material order because of the scheduling provisions of CMP Regulation No. 1, but has open capacity available in either of the two months following the month in which delivery is requested, he must accept and schedule the order for delivery as early as possible and must promptly notify his customer that the order has been accepted, subject to confirmation within 7 days, for a specified later delivery date. If the producer does not receive confirmation of the order from his customer within the 7-day period, he must reject the order, but in the meantime, he must reserve his capacity for it. If the new delivery date falls within a later quarter than the one shown on the original authorized controlled material order, the confirmation has no effect unless it is accompanied by the customer's certification that he has an allotment valid for the new quarter, in which case the customer must charge the order against that allotment. Confirmation and certification may be by letter or telegram.

Use of Allotment Numbers Clarified

Washington

• • • The distinction between the use of allotment numbers for identification purposes by Class A and Class B product manufacturers has been clarified through the issuance of Interpretation 19 to CMP Regulation 1, WPB has announced.

A manufacturer of a Class B product ordering production material needed to make the Class B product must use the allotment number identifying his allotment and authorized production schedule in placing orders for such production material. Such manufacturers must not use the allotment numbers appearing on orders placed with them by their customers.

For example, a manufacturer of electric motor controls receives an allotment of controlled materials identified by the allotment number J-3 from WPB, together with a preference rating. When he orders production material to make electric motor controls, he will use the symbol J-3 on his orders. Orders for electric motor controls placed with him by his customer will bear allotment numbers such as B-4, W-3, G-6, U-1 and others. The electric motor control manufacturer may not use these allotment numbers in placing orders for the production material for the manufacture of the controls.

Manufacturers of Class A products, however, receive allotments from their customers, rather than from WPB and therefore use the allotment numbers appearing on such customers' orders when they order

production material needed to make Class A products.

For example, a manufacturer of a Class A product who receives an order from a customer and an allotment of controlled materials identified by the allotment number O-5, will use the same allotment number O-5 in placing his orders for production materials needed to manufacture the Class A product. If he received an order for his Class A product from a manufacturer of a Class B product with an allotment, identified by the allotment number J-3, he will use this number in placing his orders for production materials.

The interpretation also calls attention to the fact that an allotment number or symbol alone never constitutes an allotment of controlled materials. In making an allotment, a customer must specify the controlled material and the exact quantity allotted and under paragraph (f) of CMP Reg. 1 allotments must be made only in the form and shape in which they are allotted to the person making the allotment.

Daily Reports Suspended

Washington

• • • John T. Whiting, director of the WPB Steel Division announced that the division no longer requires daily reports from producers on Form WPB-2787 (formerly CMP 26) after completion of these reports for all orders accepted in September.

Priority Changes

L-49—Amdt. 1 puts quota assignments for production of coil, flat, box and fabric bed springs during the 12 months period beginning Oct. 1 on a unit basis instead of a weight basis. (10-6-43)

L-144—Amended order eases control over the distribution of laboratory equipment. (10-9-43)

L-152—Sched. III assigns production quotas totaling 377,220 for the fourth quarter of 1943 to manufacturers of baby carriages. (10-4-43)

L-211—Sched. 14, as amended, permits the use of longer fenceposts made from steel rails for snow fences. (10-6-43)

L-214—Sched. 3 eases to a slight degree restrictions on the use of metals in medical and surgical furniture and related equipment. (10-9-43)

L-234—Revoked. (10-4-43)

M-1-d—Amended order removes aluminum residues such as skimmings, drosses, fines, grindings, sawings and buffings containing less than 30 per cent metallic aluminum from the definition of aluminum scrap. (10-6-43)

M-9-c—Amended order makes minor changes for the purpose of simplification. (10-4-43)

M-11-b—Statement issued by WPB clarifies overall provisions of the order as amended. (10-8-43)

M-18-a—Dir. 1 permits consumers of high carbon ferrochrome, ferrochrome briquets and high carbon chrom-X to receive deliveries after November without previous application on form WPB-689 (formerly PD 53 B) or any other application. (10-8-43)

M-61—Amended order makes several minor changes simplifying the wording, but not affecting the operation of the order. (10-4-43)

M-126—Amdt. 2 relaxes various restrictions contained in original order. (10-6-43)

P-68—Revised order describes the procedure by which a producer of steel may obtain MRO supplies. (9-3-43)

P-84—Interpretation clarifies requirements for securing preference ratings for plumbing and heating emergency repairs in question and answer form. (9-28-43)

P-84-a—Order grants authority to rerate orders for plumbing and heating repair and replacement equipment from A-10 to AA-5 without notice or certification from the customer. (9-4-43)

P-89—Order amended to conform with Priorities Regulation 3, which covers the uniform method of application and extension of preference ratings. (9-29-43)

Amend. 2 to Reg. 3 permits persons engaged in the production of iron and steel, who are eligible to use the MRO supplies preference ratings assigned by order P-68, to use the AA-1 rating assigned by it to obtain laboratory instruments and equipment. (9-29-43)

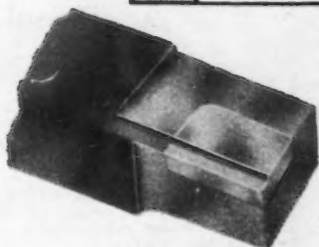
Priorities Reg. 16, as amended, provides that appeals on most E and L orders be filed with the field offices and not sent on to Washington except on appeal. (10-7-43)

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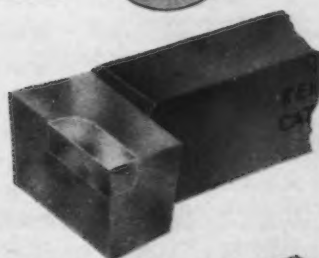
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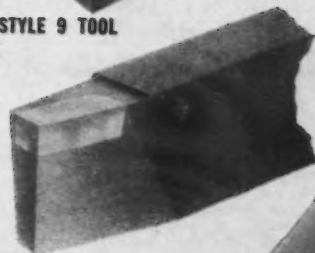


S-300

KENNAMETAL
BLANKS



MILLING CUTTER



STYLE 11 TOOL

Reporting Cut Seen Lifting Restrictions

Washington

• • • Leading off with the kicking out of CMP 26, the steel daily report form, the Steel Division expects to get rid of more report forms in the near future. September was the last month in which these forms were required.

Since a conflict between WPB industry divisions and the proponents of the Coordinated Authorization Procedure, resulted in postponement of putting CAP into effect until the second quarter of 1944, H. G. Batcheller, Operations Vice-Chairman has ordered a 40 to 50 per cent cut in paperwork.

Along with a relaxation of reporting requirements, it is expected that minor restrictions of ferroalloy use will be lifted. Nickel will be made available in small quantities. There is speculation that the same thing may be done soon with respect to molybdenum, vanadium and tungsten.

Pre-fab Pipe Under M-293

Washington

• • • Pre-fabricated pipe, used extensively in ship programs, the high octane gasoline program, the synthetic rubber program and utilities

programs, has been designated by WPB an unclassified product subject to the terms of General Scheduling Order M-293. Heavy demand for this type of shop-fabricated pipe, installation of which is essential in connection with steam and oil, has resulted in the move to assure its delivery according to pre-arranged schedules for highly critical programs.

Dollar and Cent Prices Set on Drums, Reconditioning

Washington

• • • Establishment of dollars-and-cents ceiling service charges for reconditioning used steel drums of 50 to 58-gal. capacity was announced by OPA.

At the same time, a reduction of 25c. per drum in the ceiling price of raw drums of 14 to 16-gal., 29 to 33-gal. and 50 to 58-gal. capacity was authorized, increasing by 25c. the spread between the price of unreconditioned and reconditioned drums.

Specific dollars-and-cents service charges and lower raw used drum prices are authorized in a revision of Revised Price Schedule No. 43 which now is reissued as Maximum Price Regulation No. 43 effective Oct. 12.

Direction Covering Complete Bills Revoked

Washington

• • • Revocation of Direction 13 to CMP Regulation 1, dealing with Complete Bills of Materials, was announced last Friday by WPB. This action was taken because prime and secondary consumers may no longer be required to submit complete bills of materials according to Supplement 1 issued Sept. 25, to the "Instructions on Bills of Materials."

Ferrochrome Eased

• • • WPB has issued Direction 1 to General Preference Order M-18-a permitting consumers of high carbon ferrochrome, ferrochrome briquets and high carbon chrom-X to receive deliveries after November without previous application on form WPB-689 or any other application. This direction makes no other changes in present regulations covering use of chromium.

Higher Ratings Granted Truck Replacement Parts

Washington

• • • A serious shortage of certain truck replacement parts has made necessary the uprating of preference orders from AA-2X to AA-1 for production and distribution of these items, WPB announced on Monday.

Production and distribution of replacement parts for medium and heavy trucks, truck-trailers, passenger carriers, off-the-highway motor vehicles and motorized fire equipment must be handled in the last quarter of 1943 and the first quarter of 1944, as though orders therefore bore a preference rating of AA-1, according to the provisions of an amendment to Order L-158, effective Oct. 11. Replacement parts for passenger automobiles and light trucks must continue to be produced and shipped as though orders therefore bore a preference rating of AA-2X. This amendment is designed to make available a sufficient quantity of essential parts to maintain vital motorized transport.

Price Method Clarified On Railroad Specialties

Washington

• • • Railroad specialty producers last week were authorized by OPA to use their customary transportation charges and allowances in effect on Oct. 1, 1941, in establishing maximum prices for standard railroad specialty products. This authorization was granted in Amendment 9 to RPS 41 and becomes effective Oct. 14.

Price Briefs

• Order A-1 to Amdt. 17 of MPR 188 further defines and incorporates automotive resellers concerned with plastic pipes, tubing, pipe fittings and tubing fittings.

• Amdt. 3 to MPR 165 and MPR 43 establishes dollars-and-cents ceiling service charges for reconditioning used steel drums of 50 to 58-gal. capacity. (Release No. OPA-T-1293)

• Amdt. 3 to MPR 272 authorizes a 3c. per ft. increase in sheet prices of all types of cast-iron radiation. (Release No. OPA-T-1286)

• Amdt. 6 to MPR 244 gives sellers of gray iron castings a streamlined procedure for obtaining permission to add overtime costs to maximum prices. (Release No. OPA-T-1294)

• Amdt. 5 to MPR 241 authorizes producers of malleable iron castings to apply for adjustment of prices on any casting where the maximum price is not sufficient to warrant continuance of production of castings necessary to the war effort. (Release No. OPA-3226)

• Amdt. 9 to RPS 41 authorizes railroad specialty producers to use their customary transportation charges and allowances in effect on Oct. 1, 1941, in establishing maximum prices for standard railroad specialty products. (Release No. OPA-T-1311)

• Amendment to RPR Reg. 1 of MPR 120 eliminates the Bituminous Coal Division as a party to coal price adjustment at producer levels.

Additional CMP Developments

• Revision of Reg. 1 revises the small order procedure; makes provision for tentative acceptance of authorized controlled material orders; modifies rules relating to time for delivery of authorized controlled material orders and makes minor changes of a formal nature. (Release No. WPB-4375)

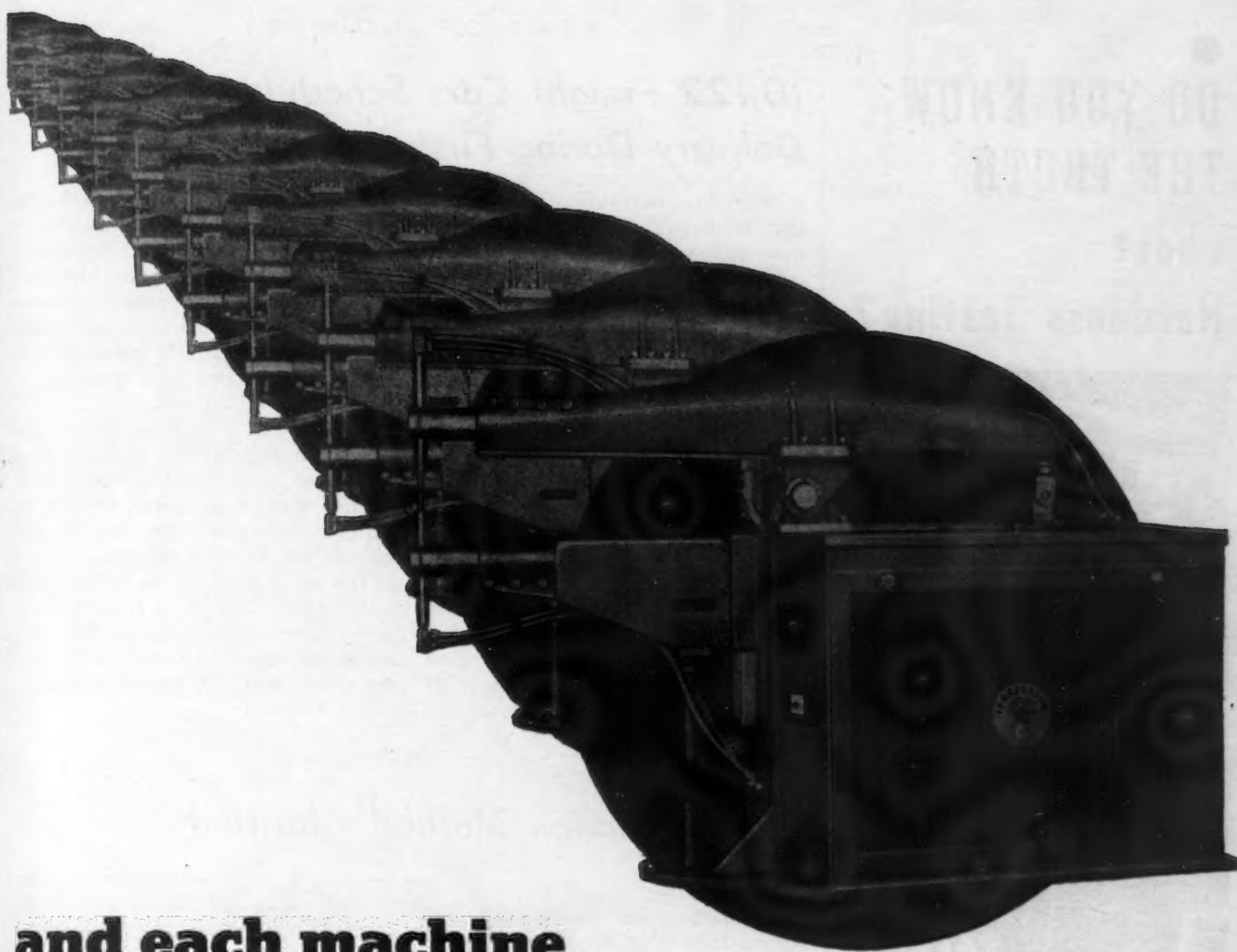
• Dir. 34 to Reg. 1 established a procedure to be followed by persons desiring to purchase Class A facilities from manufacturers where an allotment of controlled materials is needed but may not be obtained under procedures outlined in CMP Reg. 6 dealing with construction and facilities. (Release No. WPB-4370)

• Dir. 12 to Reg. 2 lightens the inventory restrictions on the manufacturers of files and rasps.

• Amendment to Dir. 16 to Reg. 1 defines the procedure to be followed in the replacement of defective steel, a controlled material.

• Dir. 13 to Reg. 1 has been revoked. (Release No. WPE-4386)

• Amended Dir. 6 to Reg. 1 establishes rules governing three types of deliveries of controlled material forms and shapes of steel. (Release No. WPB-4302)



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NEWS OF INDUSTRY

10,122 Freight Cars Scheduled for Delivery During First Quarter By WPB

• • • The ODT announced Oct. 8 that WPB has scheduled for production 15,983 additional new freight cars, of which 10,122 are for delivery during the first quarter of 1944; 4456, during the second quarter and 1405 during the third quarter.

Under CMP, WPB allotted tonnages of steel and other materials for the fourth quarter of 1943 for the construction of the 10,122 new cars. However, due to the time lag in getting the allocated materials flowing into the car builders' shops, these cars will be produced during the first quarter of 1944.

At the same time, the ODT has drawn upon authorized advance allotments for sufficient tonnage of steel for the first and second quarters of

next year, to the extent of scheduling an additional 5861 cars, making a total of 15,983 cars so far scheduled. Additional cars will be scheduled promptly upon placement of orders by the railroads, and upon authorization being received for materials for the first and subsequent quarters of 1944, the ODT said.

This method of advance allocations assists in maintaining a more even production in car building plants, and, at the same time, keeps abreast of railroad orders for new cars, it was pointed out by ODT officials.

The breakdown of the 15,983 cars according to type is as follows: Box, 4080; caboose, 210; dump, 4; flat, 867; dump car flat, 8; gondola, 1175; hopper, 9420; tank, 19; refrigerator, 200.

• • •

Steel Rejection Method Clarified

Washington

• • • Issuing an amendment to Direction 16 to CMP Regulation 1, WPB on Monday ruled that if a steel purchaser has shipped a replacement order for steel rejected by a customer for failure to meet specifications, or for other defects, and it develops that the rejection was improper, the customer must either return the replacement material or furnish the producer with the necessary certification and charge the proper allotment.

The amended direction points out that when steel is rejected for non-conformity with specifications, or other defects, the steel producer must schedule and make replacement in preference to all other orders for similar material, without requiring an additional allotment. However, if any portion of the rejected steel can be used by the customer in connection with an authorized production schedule, it may be so used, but the customer must charge the material to the appropriate allotment account. If any defective steel was received by a customer prior to July 1, it may be used on any duly authorized order without change in the allotment account.

Producers may also deliver any rejected steel, suitable to fill an authorized controlled material order or to complete any other authorized de-

livery if the rejected steel or any portion of it is suitable to fill such orders.

The direction does not apply to replacement orders for stainless steel. Replacement orders for such steel are governed by Direction 1 to Order M-21-a.

•

Direct Shipments Require Allotment Number

Washington

• • • A distributor, placing a rated order with a manufacturer, calling for direct delivery to the distributor's customer, must identify such rated order with the customer's allotment number, if any, the WPB announced. This ruling is contained in Direction No. 4 to CMP Regulation No. 3.

•

Steel Direction 18 Revoked; No Change in Procedure Seen

Washington

• • • Revocation of Direction No. 18 to CMP Regulation No. 1, dealing with condition under which controlled materials producers are required to accept orders for delivery of steel, has been revoked, the WPB announced. These conditions are now spelled out in CMP Regulation No. 1, and there is no further need for the direction.

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SOLVAY
TRADE MARK REG. U. S. PAT. OFF.

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SODA ASH No. 2-10**



...IT'S GRANULAR!

A new form of SOLVAY Dustless Dense
SODA ASH created especially for desulfurization
is now available.

Designated as No. 2-10, this product has been
made granular to further facilitate handling.

Immediate delivery of No. 2-10 can be made.
Inquiries are invited.



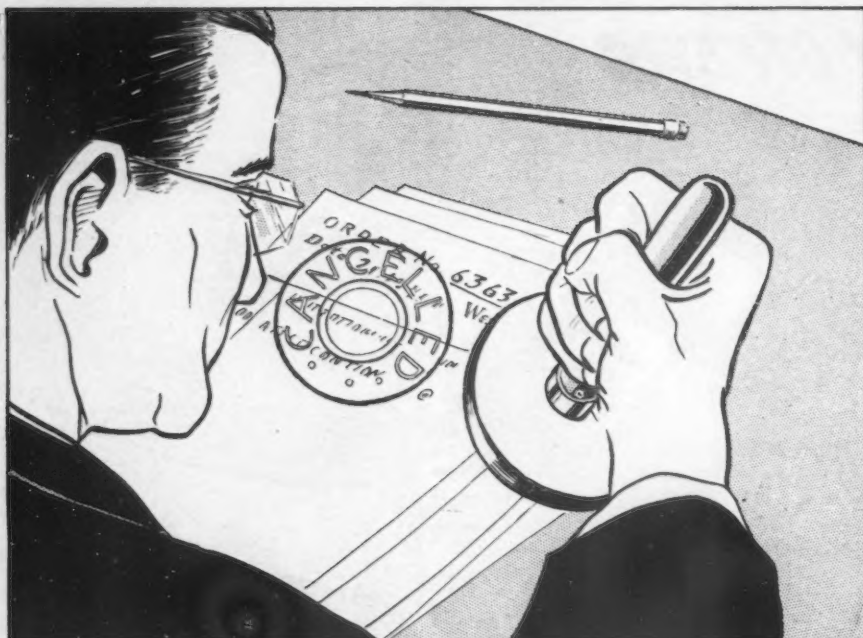
SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

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ARMISTICE WHISTLE AND THE INEVITABLE



Ability to Absorb Impact Depends on Soundness of Financial Structure ...

WARTIME activity with its great strides in new developments and rate of production has greatly accelerated the speed of obsolescence and wear and tear on industrial facilities.

It's just as urgent and patriotic to be ready for the new and better world Victory will bring as it is to speed the production of the modern implements of war, since both can be accomplished without interference,—one is useless without the other.

By replacing book values of idle or unprofitable facilities, whether it be a complete plant or a single item of equipment, by earnings from operating units, you can better serve our returning victorious boys in the armed service, both as customers and employees.

Confidential Inspection Without Obligation

HETZ CONSTRUCTION COMPANY
WARREN, OHIO

ENGINEERED LIQUIDATION SINCE 1929

BUILDINGS — EQUIPMENT — LAND — INVENTORIES — INTANGIBLES

NEWS OF INDUSTRY

New WPB Forms

- WPB-2946—Chemicals; Suppliers' schedule of deliveries.
- WPB-3233—Steel drums; Application for authorization to purchase and to use
- WPB-2948—High pressure blowers, exhausters, compressors and vacuum pumps
- WPB1953—Application for new or used plastics molding machinery or fixtures
- WPB-3008—Brass mill and wire mill copper and copper-base alloy program report
- WPB-2774—Application for authority to begin construction, for priority assistance and for allotment of controlled materials for utility construction
- WPB-3400—Scheduled products
- WPB-3003—Scheduled products
- WPB-1801—Electric motors and generators; Manufacturers' monthly report
- WPB-2752—Resistance welding machines and controls; Application for authorization to purchase
- WPB-3243—Electrical test equipment; application for authorization to receive delivery

WPM Relaxes Fence Posts, Stainless for Buckets

Washington

• • • WPB last Thursday issued Order L-211, Schedule 14, as amended and Amendment 2 to Conservation Order M-126. Together these orders will permit the use of longer fenceposts made from steel rails for snow fences. Previously permitted lengths were too short for snow fences.

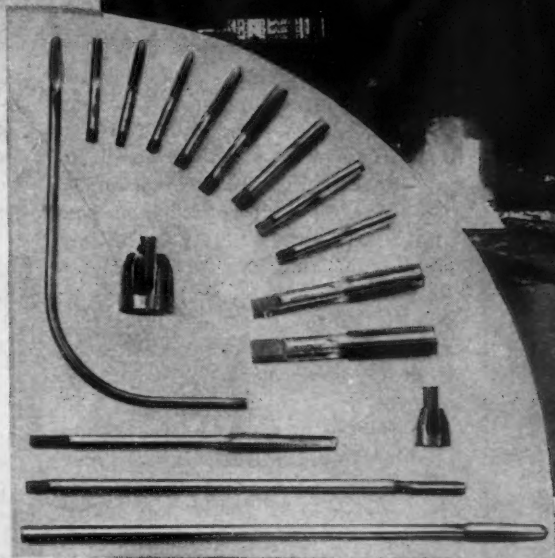
In the amendment to Order M-126, WPB also relaxed various restrictions contained in the original order. Stainless steel may now be used in buckets and pails for use in chemical plants and plants handling explosives. All kinds of iron and steel are permitted in the manufacture of weed cutters and clean-out doors.

COMING EVENTS

- Oct 13 to 16—The Electrochemical Society, Inc., New York.
- Oct. 14, 15—American Machine Tool Distributors' Association, Montebello, P. Q., Canada.
- Oct. 18 to 22—National Metal Congress and Exposition, Chicago.
- Oct. 18 to 22—American Gear Manufacturers Association, Chicago.
- Oct. 23 to 27—National Machine Tool Builders Association, Chicago.
- Oct. 25 to 27—American Gear Manufacturers Association, Chicago.
- Nov. 3, 4—Meehanite Research Institute of America, Inc., Cincinnati.
- Nov. 10, 11—Industrial Hygiene Foundation, Pittsburgh.
- April 2 to 5, 1944—The American Ceramic Society, Inc., Pittsburgh.

This battery of Ajax preheat, high heat, and quench furnaces operates under a single hood at the Greenfield plant of the world's largest manufacturer of thread-cutting tools. Average output of this battery alone is 6,000 pieces every 8 hours, with no cases of decarburization or oxidation observed in treating hundreds of thousands of tools. Aside from high quality output, time saved per shift is 1 to 1½ hours over previous conventional practice.

Representative types of Greenfield cut and ground thread high-speed taps and dies which have been salt bath hardened in the Ajax furnaces shown here.



... why

GTD GREENFIELD high-speed taps and dies are hardened in **AJAX** Salt Bath Furnaces!

According to Paul C. Farren, chief metallurgist, Greenfield Tap and Die Corporation, the development of molybdenum high-speed steels prior to the present war was seriously hampered as a direct result of difficulties encountered in heat treatment.

"Evolution," he says, "from methods using protective coating, through controlled atmospheres, to the modern high-speed salt bath furnace has been one of inestimable importance.

"We use electric salt bath furnaces of the closely-spaced, electrode (Ajax-Hultgren) type in order to minimize distortion, eliminate surface defects, and more especially to meet demands for tools which could not have been handled so satisfactorily by any other means."

BULLETINS AVAILABLE*

Besides high-speed steel hardening, Ajax Bulletins 110 and 107-A cover the equally impressive Ajax performance in carburizing, neutral hardening, heat treatment of aluminum alloys, tempering, wire annealing, brazing. Write for both bulletins.

AJAX ELECTRIC COMPANY, Inc., Frankford Ave. at Delaware Ave., Philadelphia 23, Pa.

See Ajax Room 801 Palmer House during National Metal Congress at Chicago

THERE'S AN AJAX INSTALLATION NEAR YOU!

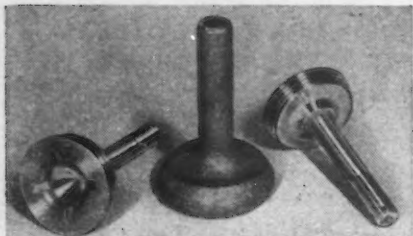


THE AJAX ELECTRIC SALT BATH FURNACE **HULTGREN**

ASSOCIATE COMPANIES:

AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORPORATION, Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC FURNACE CORPORATION, Ajax-Wyatt Induction Furnaces for Melting
AJAX ENGINEERING CORPORATION, Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

PRECISION PARTS

BOLTS FOR DRIVING
THE ENEMY NUTS

An airplane depends on this.

These fine precision-machined pieces ride the skies all over the world. They are only a small part of Uncle Sam's swift-moving ships of the air—but a vital part. They are machined at Ace from rough forgings to highly accurate finished pieces. The grinding of the threads, as well as the turning and grinding of the various diameters, must be held to exceptionally close tolerances . . . and, if you look closely, you'll see an .060" diameter hole drilled through the thickness of the head.

The ability to do highly accurate machining and grinding . . . and to do it on a mass production basis . . . is an accomplishment this war has taught us. Today, when you need small parts or assemblies come to Ace, and we will try to fit them in with our present production. Here you'll find not only the modern precision machinery, but the skill, the background, and the ingenuity to use those machines to get the required results.



The Ace story on precision work will interest you. Send for a copy.



ACE MANUFACTURING CORPORATION
for Precision Parts



1203 E. ERIE AVE., PHILADELPHIA 24, PA.

136—THE IRON AGE, October 14, 1943

U. S. Good Neighbors Increase Output of Vital Steelmaking Alloys

• • • Bolivia, Argentina, Peru, Mexico and Brazil have risen to an important place in the supply of vital tungsten, manganese and vanadium for U. S. steelmaking since war conditions cut off former sources, according to the Co-ordinator for Inter-American Affairs. Normally China was the chief supplier of tungsten to the United States. However, the reduction in quantity of the metal available from this source occurred simultaneously with the enormously increased war need for it.

In Bolivia production was stimulated by United States loans to miners for the purchase of equipment, and development work. The loans are being returned through deductions from payments for the tungsten produced. Contracts were signed with four large Bolivian mines and one small one.

Bolivia and China are now running neck and neck as tungsten producers, the Chinese ore coming out by airplane. In Argentina, advances have been made to two mines to aid production. In Peru, the metal is being mined under the over-all purchase agreements with United States procurement agencies.

Brazil, although its tungsten production is still small compared with Bolivia, has greatly increased output. Little miners in the northeast of the country have found they can make a profit on it.

Mexico's production of tungsten also has increased substantially since the

start of the war. Much is gathered from small, scattered mines in the northwest of the country by "gom-buscinos." Early in the war, they sold what they got by rudimentary methods to numerous buyers, such as general storekeepers.

More recently production has been increased by setting up a uniform buying system, and good uniform prices. At Nogales, Sonora, K. C. Li, a Chinese of the Wah Chang Trading Co., as representative of the United States Metals Reserve Co., established a central purchasing agency. Mr. Li was thoroughly familiar with tungsten operations in China.

An established price list was the core of the plan. A small miner could bring in his tungsten and get 80 per cent of his money quickly. The other 20 per cent was paid on analysis. The United States Office of Economic Warfare has had field missions in these countries, aiding them to secure greater production of tungsten and other vital metals.

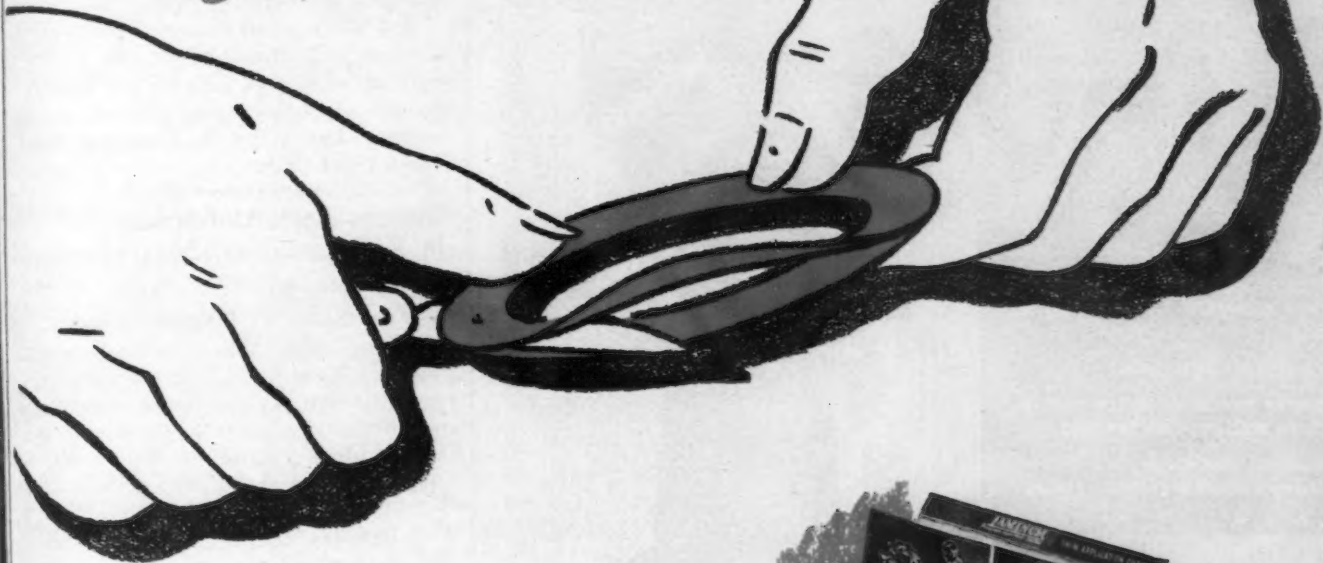
Vanadium is another metal of great importance for high speed tool steels. While the United States is the chief producer of it, Peru also has a substantial production. In fact, the world's largest vanadium mine is Peru's Mina Ragra Mine, 12,000 ft. high, on the way to Cerro de Pasco. There the Defense Plant Corp. is building a \$4,000,000 plant which is expected to increase output considerably. The plant will handle refining.

SUCCESSOR TO WELLES: Edward R. Stettinius (left), currently Lend-Lease Administrator, chats with Senator Walter F. George (center) and Senator Tom Connally (right) after the Senate Foreign Relations Committee had approved his appointment as Undersecretary of State, succeeding Sumner Welles.

International News Service



To accurate shop assembly...add quick service adjustments!



● A 20% to 30% decrease in assembly time by use of a laminated shim is only half the story.

The same Laminum shim goes on from there . . . and provides the machine with a means of easy, precision adjustment for wear, throughout field servicing.

Many modern machines are equipped with Laminum shims at original assembly. As for the others . . . field and maintenance men usually want to install Laminum shims at the first take-down. They know it saves time, labor, material, and the machine itself. Helps hold a machine at peak efficiency!

LAMINATED SHIM COMPANY
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We cut Laminum shims to your blueprint specifications. Laminum shim stock, for repair or maintenance work, is obtainable from your mill supply dealer.

Send for this Application Chart. It illustrates (with actual shop assembly photos) approved industrial uses for Laminum shims.

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THE SOLID SHIM THAT *peels* FOR ADJUSTMENT



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Gusher Coolant Pumps

THE OUTSTANDING COOLANT PUMP TODAY

FEATURES

- 1 precision ball bearing
- 2 standard interchangeable stator
- 3 precision ball bearing
- 4 rigid one-piece shaft
- 5 removing these screws permits lifting pump and motor assembly for inspection.
- 6-7 twin intakes are automatically cleansed when pump is throttled
- 8 internal louvers and revolving cup disc protect motor
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- 10 centrifugal lock nut and seal prevent moisture from reaching bearing
- 11 double acting impeller
- 12 heavy mounting flange cast in one piece with impeller housing
- 13 internal discharge thru center of intake eliminates outside piping



Look over these features and you will see some of the reasons behind the excellent performance of Ruthman Gusher Coolant Pumps. When the pump is new you get flexibility and range of control that provides a trickle or a gusher stream instantly without priming.

And more important, when the pump becomes several years old you will still get the same satisfactory service because Ruthman Pumps are noted for freedom from maintenance attention. Keep cool with Ruthman Gusher Coolant Pumps.

The
RUTHMAN MACHINERY COMPANY
CINCINNATI, OHIO

NEWS OF INDUSTRY

using a process new in Peru. This will mean the vanadium will be shipped out of the country as a fused precipitate, instead of as raw ore and some precipitate.

The great manganese deposits of Brazil and Cuba have helped meet United Nations war needs for steel and steel alloys. About 13 lb. of manganese are required for every ton of steel. Normally imported from Russia, Africa and India, manganese has been produced in growing quantity from hemisphere sources since the start of the war. Chile and Mexico are among these.

Another mineral important in steel-making is molybdenum. The great bulk of what goes into United States steel production comes from domestic sources but some is furnished by Mexico and Chile.

Lincoln Blasts Unfairness In Renegotiation; Sees Harm

Cleveland

• • • James F. Lincoln, president, Lincoln Electric Co., Cleveland, in a letter to Hon. R. L. Doughton, chairman of the Ways and Means Committee of the House of Representatives, before which committee Mr. Lincoln appeared on Sept. 14, stated that the Price Adjustment Board of the Navy "without any known supportable reason determined that 64 per cent of our 1942 business was renegotiable." An allowed profit of 3 per cent was made the Lincoln Electric Co., which was about 20 per cent of 1937 profits and less than 20 per cent of the rate of profit allowed the DuPont Co. by the same board in 1942.

Renegotiated to the extent of \$3,250,000, Mr. Lincoln charged that such a loss makes it impossible to follow the company's previous course of outstanding skillful manufacturing and still remain a going concern. Consequently, Mr. Lincoln stated that the company refused to accept the ruling and will resist the decision to the end. The Price Adjustment Board Committee, under the chairmanship of Kenneth Rockey, served notice on Lincoln Electric Co., according to the letter, that it will proceed to enforce its penalty.

As examples of the unfairness of the renegotiating policies, Mr. Lincoln, in a telegram to Congressman Doughton, stated that DuPont Co. was allowed 18 times the rate of profit allowed Leland Electric Co., Dayton, Ohio; Eastman Kodak Co. received 19 times the rate of profit offered Towsmotor Co., Cleveland.

Five shots, cold, level, unhurried. A body slumps to the pavement. Car door slams. Gears whine . . . Silence.

Bar-room voice at a pay-phone: "A guy's just been murdered, Third Avenue and . . ."

A bored, mechanical monotone crackles in the gloom of a cruising police car: "--- Third Avenue and Green Street, man reported murdered."

And twenty seconds later, as a siren sobs to the end of its griefless requiem, the law takes over . . . Fingerprints, photographs . . . ballistics report, teletype, radio . . . transportation . . .

What part did machine tools play in helping to solve this murder? A very great part. For all this integrated mechanism of law and order and justice was made possible by a relatively few basic precision machine tools.

And one of these . . . the internal grinding machine . . . is essential to the creation of literally everything that goes into the vast and intricate mechanization of life today.

What part did machine tools play in helping to . . .

solve this murder?



BRYANT CHUCKING GRINDER CO. SPRINGFIELD VERMONT, U.S.A.

SPEED and ACCURACY



WICACO INTERNAL GRINDERS

are particularly efficient in the continuous rush production of Bomb-sight Components, Aircraft Engine Parts, Guns, Cartridge Dies, and a wide variety of other units requiring extreme precision.

Underslung drive, vibration free and in constant tension . . . Rigid workhead with oversize bearings . . . Dynamically balanced revolving parts—these features are responsible for the exceptional accuracy of Wicaco Internal Grinders.

Prompt deliveries. Write for complete descriptive matter.



THE

WICACO MACHINE CORP.

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Turnover Causing 3 to 1 Hiring in West

• • • Labor turnover in the aircraft industry on the West Coast is making the hiring of three persons necessary for a gain of only one and meanwhile boosts shortage statistics three times above actual labor demand. John Lee, a member of the National Aircraft War Production Council, announced last week that the West Coast aircraft industry alone would be required to hire 1,700,000 persons to gain the additional 400,000 or 500,000 workers needed to lift their production quotas to military quotas.

Toolmakers Meet On New Standards

Washington

• • • Tasks of precision tool engineer's and technicians from industry were named last week at a meeting of the Precision Industry Advisory Committee with WPB and other government officials to consult in drafting standards for four categories of precision tools and measuring instruments.

The projects call for publication of the standards in bulletin form, covering tool room specialties, micrometers, dial indicators and miscellaneous precision tools. Work already accomplished by individual firms will be incorporated in the project. Members of the industry advisory committee agreed that a bulletin similar to one used in Great Britain for the guidance of precision tool builders would be of great value in the war effort of the industry and in post-war operations. Procurement problems were outlined to the committee by representatives of Army Ordnance and the Navy.

In a discussion of Order E-5-a, governing the production and distribution of precision measuring hand tools, it was decided that no changes would be recommended until the order had been in operation longer.

Interlake Headquarters Moved to Cleveland

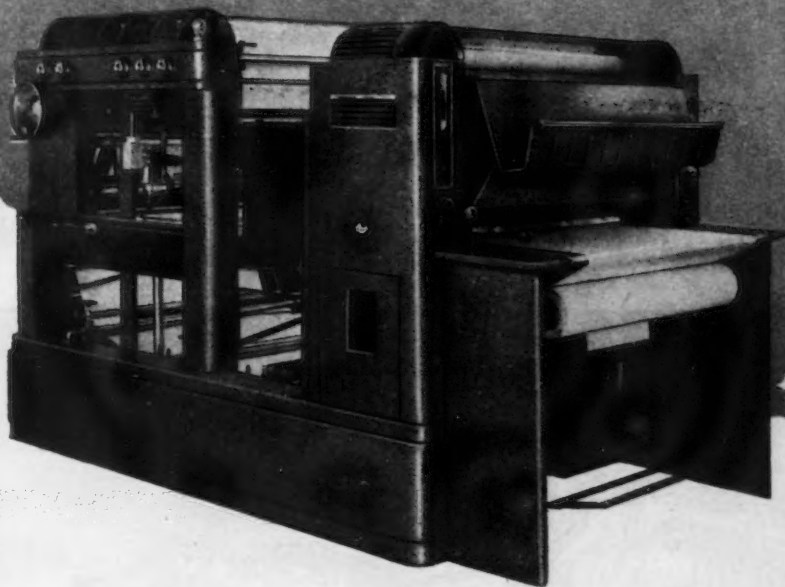
Cleveland

• • • The transfer of headquarters from Chicago to Cleveland of the Interlake Iron Corp. was announced this week by Leigh Willard, president. The move will take place about Nov. 1, involving about 30 people from the Chicago office. A staff will be maintained in Chicago.

OUTSTANDING

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proved daily by PEASE BLUEPRINTING MACHINES
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Pease "22-16" — Continuous Blueprinting, Washing, Developing and Drying Machine—Production Speed, 20 feet per minute. (Pease "22," not shown, has a Production Speed of 30 feet per minute.)

While American industries astonish the world with unbelievable production, Pease Continuous Blueprinting Machines, with a production speed of 30 feet per minute,* are more than meeting every requirement by producing millions upon millions of square feet of all important Blueprints. From the Atlantic to the Pacific, from Canada to the Gulf, Engineering Departments are depending upon Pease Machines to supply them with a limitless flow of better Blueprints, faster and at lower per square foot cost.

Performance must be proven by records of outstanding achievement. Pease Continuous Blueprinting, Washing, Developing and Drying Machines have just such records... records showing the greatest production of Blueprints ever accomplished... records showing the greatest speed and highest quality of Blueprint production at the lowest cost... records showing long life, reliability, service and efficiency... records showing more Pease Blueprinting Machines in use than any other make.

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EXCLUSIVE PEASE FEATURES

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- ★ **Horizontal "Floating" Water Wash** floats prints free from tension and prevents wrinkles, stains, bleeding.
- ★ **Quick Change Chemical Applicator System** very economically allows change from Blueprints to Negatives in 20 seconds.
- ★ **Eight-inch Drying Drums**, thermostatically controlled, heated by gas or electricity, dry the prints "flat as hung wallpaper."
- * Pease "22"

Pease Blueprinting Machines

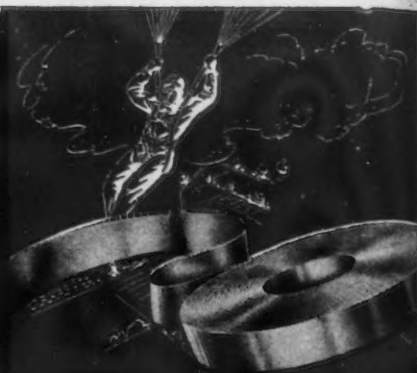
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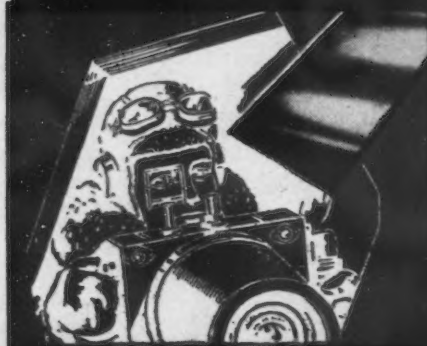
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FLEXIBLE SHAFT CASING



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MACHINE GUN RIVETS

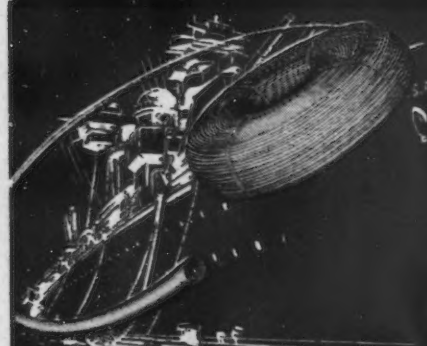


FLAT WIRE FOR
PARACHUTE HARNESS HARDWARE

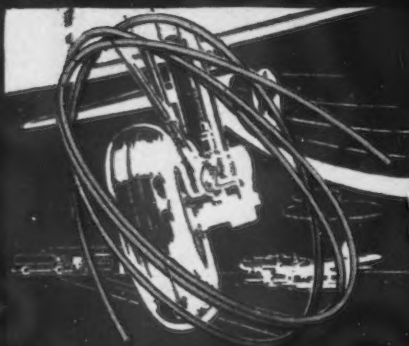


FLAT WIRE FOR
AERIAL CAMERA PARTS

Time IS PRECIOUS THAN



ROUND WIRE FOR REINFORCING
BATTLESHIP FUELING HOSE



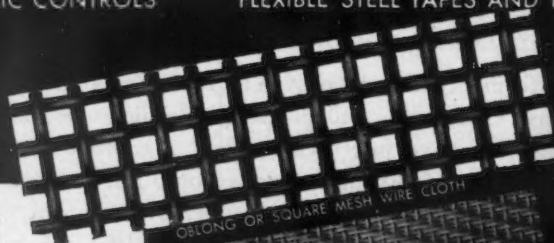
ROUND WIRE FOR
AIRCRAFT HYDRAULIC CONTROLS



FLAT WIRES FOR
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WOVEN WIRE, TOO!

For guarding, reinforcing, filtering—from one inch rod stock down to one-thousandth wire—in steel, brass, bronze, copper, stainless, monel, aluminum—order it from Roebling!



OBLONG OR SQUARE MESH WIRE CLOTH



DUTCH TWILLED WEAVE



JERSEY STRANDED FILTER CLOTH



**MORE
EVER!**

A YEAR AGO, time was short. We were losing the war.

Today, time is more precious than ever. Our boys are overseas. Facing the guns. They're winning. But some are dying.

Is there any way you can shorten the war by a day? Maybe we can help, by delivering a Roebling Round, Flat, or Shaped Wire to your specifications, ready to

be finally fabricated into vital parts.

You can depend upon its steel analysis, its temper, its dimensions, its finish. We've been tackling tough jobs of this kind for years, and getting them done. And now—we want to get those boys back, too.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities



ROEBLING pacemaker in
wire products

THESE Wickman PRINCIPLES

LAYOUT 50 TIMES THE SIZE OF PROFILE
TO BE GROUND

50 TO 1
PANTOGRAPH

30 POWER
MICROSCOPE

CROSS HAIRS OF MICRO-
SCOPE FOCUS ON WORK
AND GRINDING WHEEL.
INTERSECTION OF CROSS
HAIRS CORRESPOND TO
THE POSITION OF THE
POINTER ON 50 TIMES
SIZE LAYOUT.

**Make Possible The
ACCURATE GRINDING
Of Profiles Such As
These In Tungsten-
Carbide Or Other Hard Metals**

● The Wickman Profile Grinder has for a number of years proved exceptionally efficient for the grinding of irregular shaped contours on flat or circular form tools, male and female profile gages, punches, open and sectional die segments, etc.

● Accuracy is held to within $\pm .0005''$. This accuracy is not affected by wheel wear and no special shapes or radius dresser need be used.

● Finished parts can be checked against the layout without removal from the machine. Reversing the operations followed in grinding, layouts can be made of parts having previously undetermined profiles.

Literature Containing Full Information Is Yours for the Asking

WICKMAN PROFILE GRINDER

THE Wickman
CORPORATION

15537 WOODROW WILSON
DETROIT, MICHIGAN

Among the Week's Trade Notes

Porcelain Enamel & Mfg. Co., Baltimore, has changed its name to the PEMCO Corp.

Bridgeport Grinding Machine Co., Bridgeport, Conn., has changed its name to the B-G Co.

John R. Cassell Co., Inc., New York, have established a new department, which will be known as the Industrial Photographic Materials Department.

Kelley-Koett Mfg. Co., Covington, Ky., are constructing a new one-story addition to their plant facilities.

Edward Valve & Mfg. Co., Inc., East Chicago, Ind., announce the appointment of the Dunbar Engineering Co., New York, as sales representative for the Connecticut territory and the appointment of W. E. Bowler, Philadelphia, as sales representative for the Reading, Pa., territory.

Marathon Foundry & Machine Co., Wausau, Wis., has leased the building formerly occupied by the Bluhm Automobile Co. to make plant number three of the firm's expansion program.

United States Steel Products Co., a U. S. Steel subsidiary, has contracted to purchase the manufacturing assets of the Petrolsum Iron Works Co., a subsidiary of American Republics Corp.

Advance Pressure Castings, Inc., announce that their executive offices, sales, engineering, purchasing departments and technical laboratories are now located at 894 Manhattan Avenue, Brooklyn 22.

North American Philips Co., Inc., Dobbs Ferry, N. Y., will move its commercial and administrative departments to the Pershing Square Building, 100 East 42nd Street, New York. The Industrial Electronics Equipment Division of the company will also move from 419 Fourth Avenue, New York, to the Pershing Square Building.

H. K. Porter Co., Inc., Pittsburgh, has named F. B. Schwartz, manager of Minnesota Pneumatic & Electric Tool Co., as special representative for their products in the Northwest territory.

T. Shriver & Co. has become the T. Shriver & Co., Inc., Harrison, N. J.

Taft-Peirce Mfg. Co., Woonsocket, R. I., has announced the appointment of Frey Industrial Supply Co., Los Angeles, as representatives of their products in southern California.

Precision Scientific Co., Chicago, have acquired the sole rights to manufacture and market metallurgical apparatus developed by Dr. Tracy C. Jarrett of the Koppers Co., Pittsburgh.

Award of a contract for a new flight hangar to cost \$2,300,000 has been announced by the Goodyear Aircraft Corp. It is being financed by the Defense Plant Corp. Construction already is under way. It will be located about 190 ft. west of the existing airship dock at Akron, in which the Macon and Akron were built.

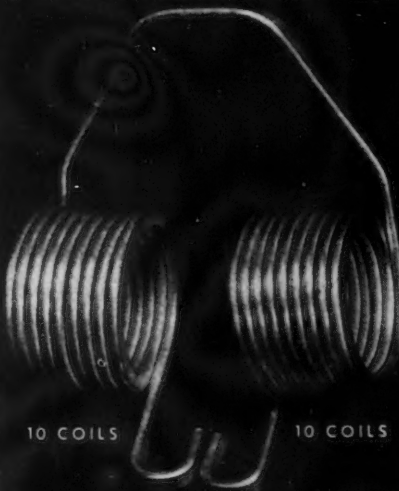
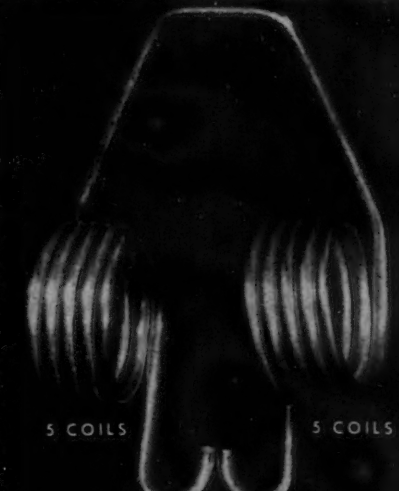
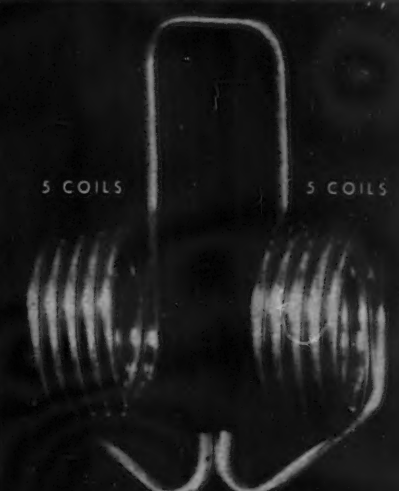
Kennametal, Inc., with factories and main office at Latrobe, Pa., is opening an office and warehouse at 3701 N. Broad St., Philadelphia, Oct. 1.

Clearing Machine Corp., Chicago, manufacturer of hydraulic and mechanical presses, have opened sales and service offices in New York and Cincinnati. Mr. J. R. Sheppard is in charge of the New York office at 30 Rockefeller Center, and Mr. W. F. Dew is in charge of the Cincinnati office at 2107 Carew Tower.

EVOLUTION

OF A SPECIAL TORSION SPRING REDESIGNED FOR QUANTITY PRODUCTION

This classic example of redesigning an important airplane spring to change from a very special spring (now impossible to obtain) to a standard type of spring is an every day occurrence in the Engineering Department of The Lee Spring Company, Inc.

ORIGINAL SPRING SPECIAL DESIGN	FIRST REDESIGN (FOR QUICK EMERGENCY USE)	FINAL REDESIGN FOR QUANTITY PRODUCTION
 <p>10 COILS 10 COILS</p>	 <p>5 COILS 5 COILS</p>	 <p>5 COILS 5 COILS</p>
<p>DESIGN No. 1</p> <p>Used special alloy steel.</p> <p>Used special rectangular section with round edges.</p> <p>Used special looping that was difficult to manufacture.</p> <p>Weighted 1/4 pound each.</p>	<p>DESIGN No. 2</p> <p>Used standard music wire steel.</p> <p>Used standard round section of wire.</p> <p>Used same special looping to ensure exact replacement in application.</p> <p>Weighted 2/3 of original.</p>	<p>DESIGN No. 3</p> <p>Uses same standard wire as No. 2 but is made with a conventional inside loop to speed up production.</p> <p>Weight 2/3 of original.</p>

SAVING IN TIME=400%

Spring No. 1 of special design, material and section was in general use before the war. When such special springs could no longer be obtained, The Lee Spring Company, Inc., suggested redesigning to use standard material. An urgent request for a small quantity of springs, needed immediately for airplanes completely manufactured, was met by furnishing Design No. 2. But when the airplane manufacturer required quantities numbering many thousands and quickly it became necessary to "redesign for production" to reduce manufacturing time. All three springs exert the same inch pounds torque and do exactly the same job, fit the same application and are now

performing for the war effort. . . Solving your spring problems is our established profession and a modern series of bulletins our printed proof. We'll either tackle your individual problem or mail you the literature—both without obligation.

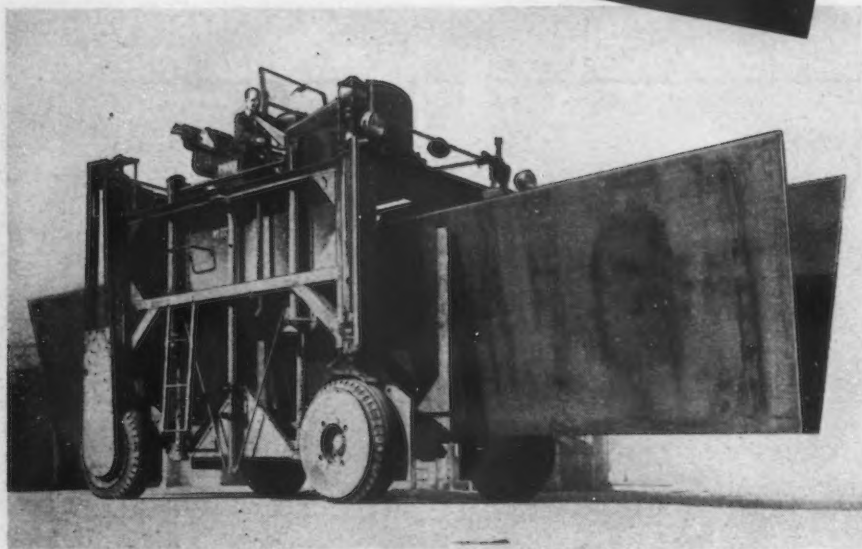
LEE
Spring Company, INC.

30 MAIN STREET
BROOKLYN 1, N. Y.



WHAT DO YOUR HEAVY HANDLING JOBS CALL FOR? ★

This Heavyweight
**CHAMPION
CARRIER**



A west coast shipyard economizes by hauling heavy steel plate with a Ross Model 90 Carrier.

or This Rugged
LIFT TRUCK



Rapid movement and quick loading mean everything in these days of transportation strain and congestion in mills, freight yards and docks.

The heavy capacity of Ross Series 90 Carriers; the maneuverability and short turning radius of Ross 70 H Carriers, with 4½ ton capacity, and Ross Heavy-Duty Hydraulic Lift Trucks, 3 to 7 ton capacities, furnish the answer to many of your handling problems.

Bulletin I-103, which tells the full story of these useful, durable, economical machines, will interest you. Write for it today.

THE ROSS CARRIER COMPANY, BENTON HARBOR, MICHIGAN



NEWS OF INDUSTRY

Sales Managers Question Business' Sales Attitude

Milwaukee

• • • "How can industrial leaders be so smart in their relations with customers and so dumb in their relations with government?" was one of the smackers put before the Milwaukee Sales Managers' club at its recent meeting by T. Spencer Shore, vice-president and treasurer of the General Tire & Rubber Co.

"How can we in American industry be the best salesmen in the world and yet not know how to merchandise successfully the greatest product known to mankind—the American way of life?"

Answering his own questions, Shore said:

"I can't imagine anything easier to sell than the American way of life to the peoples of France, Norway, Belgium, Greece—yes, even to the peoples of Italy and Germany.

"I can't imagine anything easier to sell to the American people than the free enterprise system, providing we spend as much time and thought on selling it as we do on selling them a package of chewing gum.

"The American way of life—the free enterprise system—is the greatest incentive to hard work, thrift and efficiency. We know that government controlled and government operated business is less efficient than a business run for a profit. We saw that illustrated when the government tried to run the railroads in the last war. We saw it illustrated vividly on every WPA project.

"With all misfortunes and inequities we still have the greatest country in the world, with the highest standard of living known to mankind. This was accomplished by American ingenuity, efficiency and thrift—by an ambitious people with courage and capacity for hard work under the free enterprise system.

"The American way of life is being torpedoed. The forces against it are powerful and sinister. For the first time in our history a ceiling has been placed on what a man can earn.

"If the American way of life is to survive, men in industry must understand government and they must take an active interest in it.

"We've known we can't sell our product by knocking our competitors. How many of us have thought that we could compete in government by knocking the sales manager or the sales manager's wife?



If Nazis were penguins...

IMAGINE ARMIES of penguins goose-stepping all over the South Pole! Heil, Pengler!

But penguins aren't birds of prey. They're just simple fishermen. They'd never yearn for other people's territory. Even if they enjoyed goose-stepping, they'd confine their marching to the Antarctic.

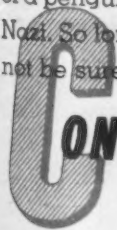
Suppose the situation were reversed. What if penguins were Nazis? They'd certainly become dissatisfied with the South Pole. They'd start "protecting" their neighbors. And after a few peace overtures, they'd attempt a Polar blitzkrieg!

The moral? Just this: You can't make a plunderer out of a penguin, and you can't make a nobleman out of a Nazi. So long as there are Nazis in the world, men cannot be sure of being free.

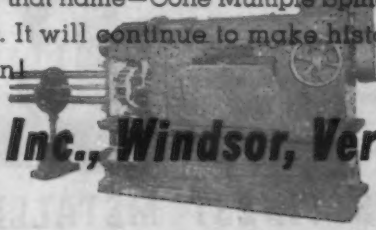
That's why we must war to the death against the Nazis. In doing so, we must lean heavily on our machine tool industry. We can lean with confidence. This miracle-making industry has overcome Germany's 7-year head start in about a year. And today, for every one machine tool produced by the Nazis, we are producing 5!

A potent factor in this production miracle has been the Multiple Spindle Automatic Lathe made by Cone. These production titans of the machine tool industry are currently used in the production of parts for guns, tanks and planes.

Remember that name—Cone Multiple Spindle Automatic Lathe. It will continue to make history after victory is won!

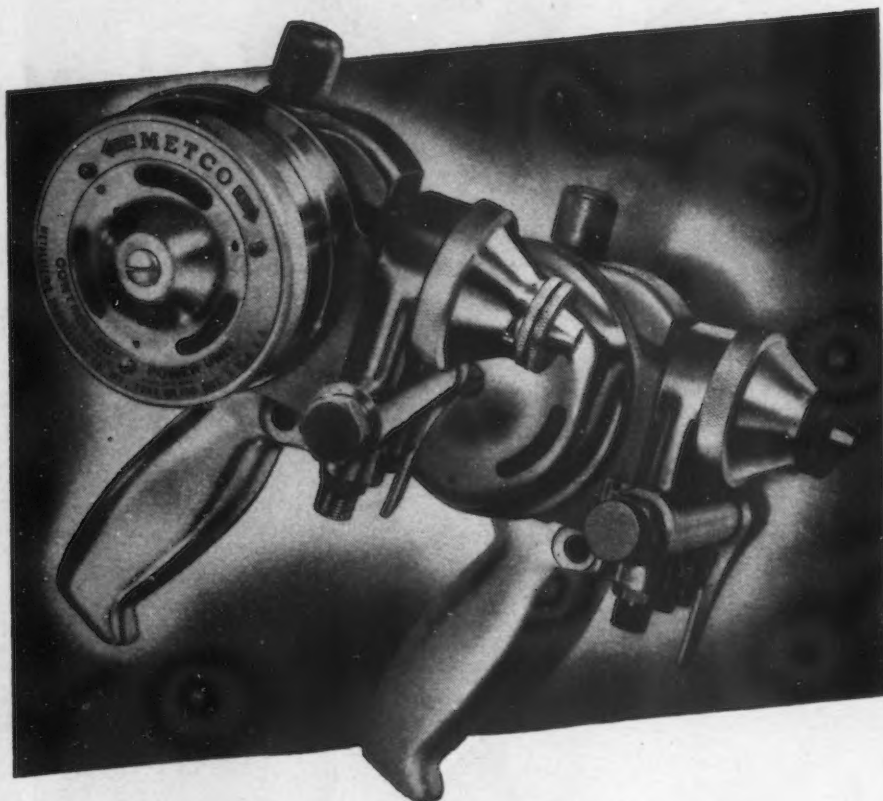


ONE Automatic Machine Company, Inc., Windsor, Vermont



Choose Your Weapons

in the War against Waste



Which of these METCO Metallizing Guns
meets your price and priority needs?



Send for Free Copies

METCO NEWS, the only periodical on metallizing, tells how sprayed metal restores worn mechanical equipment to service . . . salvages mis-machined and other defective parts from the scrap heap . . . protects corrosive metals against chemical attack . . . helps solve hundreds of wartime maintenance and production problems. Request on your letterhead puts you permanently on the mailing list.

TWO TYPES of METCO Metallizing Guns—each the leader in its class—enable you to start *now*, to conserve materials and manpower as you have never done before. For maximum power and economy at all spraying speeds, and for production coatings especially, select the Type 2E with Power Control Governor. It is the standard of metallizing efficiency in thousands of plants throughout the world. When extremely light weight and lowest initial cost are desired, choose the Type E. You can convert it into a Type 2E later, if you wish, simply by adding the Power Control Governor. Write for particulars, prices, and priority data.

METALLIZING ENGINEERING COMPANY, INC.
38-22 30th Street Long Island City 1, N.Y.
In Canada: B. W. Deane & Co., Ltd., Montreal

METCO

REG. U. S. PAT. OFF.

WORLD'S FINEST METALLIZING EQUIPMENT

NEWS OF INDUSTRY

"We in industry must take an active interest in government—not just once every four years before election—but every single day. The president of every company must appreciate that he has no right to criticize unless he is willing to take the responsibility of doing his part of the job. That means supplying manpower for government jobs. It means that we have got to give our representatives in congress the benefit of constructive thinking—not in a sarcastic, critical manner, but in the same manner as we would talk to our best customer.

"A large portion of our labor trouble has been due to shortsightedness of management. Too many companies have a man of mediocre ability in charge of personnel. That job today in any manufacturing company ranks in importance next to the president. That man has got to know what our employees think of us, just as we must know what our customers think of our product. Can you imagine anyone staying in business today who doesn't change his product to meet his market? The same principles apply in our employee relations.

"My conclusion is that the American way of life will survive, if the American people want it enough to fight for it on the home front. It isn't going to be done by selling ourselves at meetings of the National Association of Manufacturers. It has to be done by selling with the same aggressiveness and thought we use in successfully merchandising our own products."

Renegotiation Stand In New MAPI Pamphlet

Chicago

• • • "Capital Goods Industries and Contract Renegotiation," is the title of a 38-page pamphlet containing the statement made by William J. Kelly, president, Machinery & Allied Products Institute, before the Ways and Means Committee of the House of Representatives on Sept. 17. Recommending repeal of Section 403 in the Revenue Act of 1942, Mr. Kelly also made these proposals: Renegotiation of profits after taxes, allowance of post-war reserves, allowance of special amortization and special treatment for profits from production of capital goods. In the event that Section 403 is not repealed, Mr. Kelly made other suggestions regarding carry-back and post-war credits. The booklet is obtainable from the institute office at 221 North LaSalle Street, Chicago.



TWISTERS, BENDERS, and BIMORPHS

for War... and the Peace to come

The keynote to Victory is Teamwork. The Allies have it in battle and production. Twisters, Benders, and Bimorphs form a team as a part of The Brush Surface Analyzer that measures the smoothness of finished surfaces. This tiny team can do the work of an army of men.

SEE US IN
ROOM 843
AT THE
NATIONAL
METAL SHOW

Today Brush Crystals are doing wartime service, but in the peace to come these same crystals (Twisters, Benders, and Bimorphs) will serve people everywhere in untold ways.

Thus, The Brush Development Company works today, for the better things tomorrow.

THE BRUSH DEVELOPMENT COMPANY

3311 Perkins Avenue



Cleveland, Ohio



Do you know how many **NEW** uses there are for *Stainless Steel* wire?

• Wartime need said time after time, "*this cannot be made of Stainless Steel, but it must!*" And it was—without argument but not without development work that will result in great gains to industry after the war.

Of course, this new knowledge of Stainless Steel and Stainless Steel Wire is of value only to the war effort today. But don't overlook its possibilities in your own plans for peacetime production.

PAGE STAINLESS STEEL WIRE will be offered you in a wide range of shapes such as channel, oval, half-round, flat, triangle, keystone, hexagon, octagon, etc., in diameters up to $\frac{3}{8}$ ", and end section areas to .250 square inch.

PAGE *Stainless Steel* Wire

PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, New York, Pittsburgh, San Francisco

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

NEWS OF INDUSTRY

Reports Increased Foreign Business

Cleveland

• • • In a statement to stockholders, Arthur G. McKee & Co. pointed out that its dollar volume of new contracts to date this year has been materially lower than in the similar period of 1942. This condition, common in the construction industry, was expected, but contracts taken have been satisfactory and at a higher rate than in a pre-war normal year. Foreign business during the third quarter has been considerably greater than in preceding quarters and pending negotiations for both domestic and foreign business indicate a considerable volume of new business may be closed before the end of the year.

During the third quarter the company completed two large blast furnace plants and anticipates that three more will be completed before the end of the year. One large steel plant and a rolling mill plant that have been under construction for two years are expected to be completed before the end of the year. The iron and steel making operations under construction by the company in Brazil will not be completed before 1945. Improvement is shown in ocean transport of materials to Brazil which should make better progress of the job possible.

Investigations and development are under way by the company in many lines, one of the major of which is in connection with beneficiation and sintering of iron ores which has already resulted in the obtaining of several sizable construction contracts.

WPB Appoints New Plumbing Advisory Group

Washington

• • • The War Production Board announced formation during the past week of an Industry Advisory Committee for the plumbing and drainage industry.

Government presiding officer: William C. Macdonald; committee members: L. C. Andersen, Portland Iron Works, Portland, Ore.; T. B. Robbins, The Bignall Co., Medina, N. Y.; L. N. Boosey, Norman Boosey Mfg. Co., Detroit; J. Walter Singmaster, Reading Foundry & Supply Co., Reading, Pa.; Leo J. Filstead, John C. Kupferle Foundry Co., St. Louis; Thos. Van Helms, Central Specialty Co., Detroit; M. J. Hirshstein, Josam Mfg. Co., Cleveland; J. J. Warner, Fee & Mason Mfg. Co., Inc., New York; George H. Quest, Blake Specialty Co., Rock Island, Ill.; F. A. Warren, Haley-Warren, Inc., Atlanta; M. A. Zurn, J. A. Zurn Mfg. Co., Erie, Pa.

Synthetic Rubber to Erase a Madman's Dream

Today, an increasing quantity of our rubber is the product of chemistry and engineering — man-made in a maze of pipes and tanks.

At Baytown and Houston, Texas; at Los Angeles, California, and Akron, Ohio, new synthetic rubber plants are being erected — or are now in operation — by the Goodyear Tire & Rubber Company for the Defense Plant Corporation. At Sarnia, Ontario, a plant is nearing completion for the Canadian Synthetic Rubber Corporation.

We are proud that J. Gordon Turnbull, Inc., contributed to the design and completion of these modern plants that will help erase forever Axis dreams of world domination.

The Turnbull Organization with its engineering skill and many years of "know-how" experience has been associated also in the planning and construction of the giant North American Aviation Company plant at Dallas, Texas; the Sinclair Rubber, Inc. power facilities for the integrated synthetic rubber plant at Houston, and in many other current war-important projects.

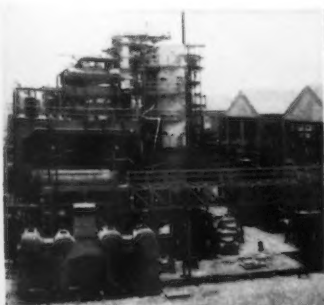
Turnbull engineering assures maximum production in the shortest possible construction time — with a minimum of critical building materials. Practical experience with "unusual" engineering problems speeds design and erection — saves precious time so vital to all-out production.

This is the proper time to start thinking of your post-war building projects. Perhaps a suggestion now — from our experience in many fields — may better shape your plans. We will be pleased to discuss them with you at your convenience.

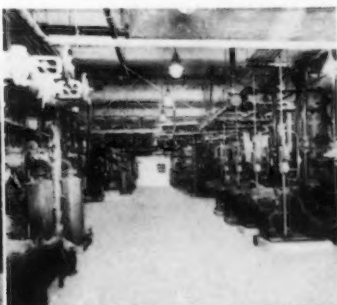
**J. GORDON
TURNBULL
INC. CONSULTING
ENGINEERS**

Main Office: 2630 Chester Avenue, Cleveland, Ohio

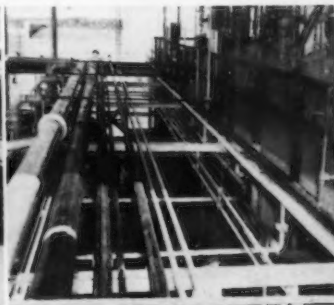
Branch Offices in Dallas and Houston, Texas



REACTOR BUILDING—HOUSTON



PUMP ROOM—LOS ANGELES

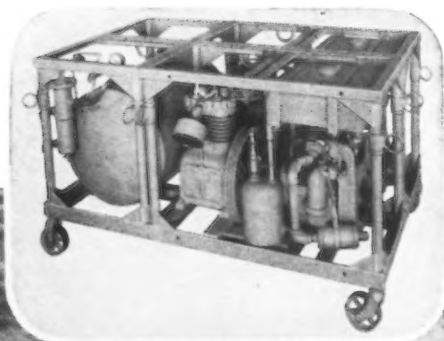


MATERIAL INTAKE—BAYTOWN



DRIER—AKRON

Raiding Davey Jones' Locker for Axis Ships



Official U. S. Navy Photograph

Down in Davey Jones' Locker lie countless Axis ships—mute evidence of the unerring marksmanship of Allied aircraft, surface vessels and submarines.

Your Navy loses interest in most of them—once they're sunk. But when they clog captured harbors something must be done quickly. So Uncle Sam's deep-diving sailors "bring 'em up."

Dangerous work? You bet! If anything stops their supply of air, these Navy divers are really in a spot. To prevent such mishaps, Uncle Sam provides his salvage crews with the finest air compressing equipment available. At Oran, Casablanca and other captured ports DeVilbiss Air Compressing Outfits supply the air to "keep 'em diving" through vital salvage operations that not only clear these harbors but add valuable tonnage to our merchant fleet.

Everywhere on the production front, the home front, as well as the battle front, DeVilbiss Air Compressing Outfits are performing jobs essential to Victory. DeVilbiss Spray Systems, too, are in the fight, helping to paint all types of weapons and munitions *faster*—to get them where they're needed *sooner*.

And while we are devoting all our resources to speeding the day of Victory, we of DeVilbiss look forward to the time when we can apply the new-style equipment and methods developed for war to the improvement of peacetime industries.

THE DEVILBISS COMPANY • TOLEDO, OHIO

Canadian Plant: WINDSOR, ONTARIO



PROUD to have won the coveted Army-Navy "E" for excellence in war production, the men and women of DeVilbiss pledge to continue giving their all-out best—for Victory.

DEVILBISS SPRAY SYSTEMS

SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

**The SMALL WHEELS
That Are Doing»»**

A GREAT BIG JOB!

**CHICAGO
GRINDING WHEELS**

In thousands of war plants, you'll find these tough, long-lived wheels on production lines grinding, burring, smoothing and finishing edges and surfaces on all kinds of products, parts, fixtures and tools, regardless of shape or material.

Custom built for your special work in any grain, grade or size, to meet today's exacting, get-the-job-done demands.

Prompt Delivery..IT'S REALLY TRUE

● Some users may still be skeptical, but we assure you again that we make quick shipments. You see, with WPB approval, we now specialize* on Grinding Wheels and Mounted Wheels and Points up to 3" in diameter only. All larger sizes are out for the duration. Then too, our central location brings most customers within one day's shipping distance.

Write for Catalog today

CHICAGO WHEEL & MFG. COMPANY

America's Headquarters for Small Grinding Wheels, Mounted Wheels and Points

1101 W. Monroe St. Dept. RA, Chicago 7, Illinois

FREE TEST WHEEL—To get acquainted with these fine wheels and our fast service, we'll send one postpaid. Tell us size wheel and material you'd like to try it on.

*Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry.

Send Catalog. Interested in ☐ Grinding Wheels. ☐ Mounted Wheels ☐ Send Free Wheel. Size.....

Name.....

Address.....

RA-10

KINNEAR MOTOR OPERATED ROLLING DOORS

DOOR CONTROLS WHEREVER NEEDED!

You get a double measure of high efficiency in Kinnear Motor Operated Rolling Doors. They combine the extra speed and ease of pushbutton control with space-saving, out-of-the-way coiling upward action!

It takes only a split-second of manpower to open or close the doors. Traffic and materials handling are quickened, no labor-time is lost, heating and air-conditioning economies are realized. And for still further time-saving efficiency, you can have any number of remote control switches.

Floor, wall and ceiling space remains clear and usable at all times. The doors open out of the way of all activity, and remain out of reach of collision or wind damage until closed. For efficiency plus protection, install Motor Operated Kinnear Rolling Doors. Write for details. To save vital metals, the time-tested Kinnear WOOD Rolling Door is filling many wartime needs. The Kinnear Mfg. Co., 1760-80 Fields Ave., Columbus 16, Ohio.

SAVING WAYS
IN DOORWAYS

KINNEAR

ROLLING DOORS

NEWS OF INDUSTRY

Steel Warehouse CMP Queries Answered

Cleveland

• • • Answers to members' questions relative to warehouse operations under the Controlled Materials Plan are released by the Steel Products Warehouse Association here. Some selected problems not previously covered are given below:

Product Group 23 under M-21-b-2 includes "lead coated sheets." Does this mean that long ternes now are classed as a merchant trade product?

No, long ternes still are classed as a general steel product. An interpretation received from Washington states:

"There is a distinction between lead coated products and long ternes. Lead coated products is taken literally and means that the sheet involved has been coated with lead, and long ternes are sheets covered with terne metal which is not a pure lead. To put this distinction into other words, lead coated products are products given a lead coating and long ternes are products given an alloy coating of which lead is only one of the component parts. Consequently, lead coated sheets are under Order M-21-b-2 in Product Group 23, and long ternes are under M-21-b-1 in Product Group 14."

A warehouse sells both hot-rolled and cold-rolled sheets. To what extent may it replace hot-rolled material with cold-rolled?

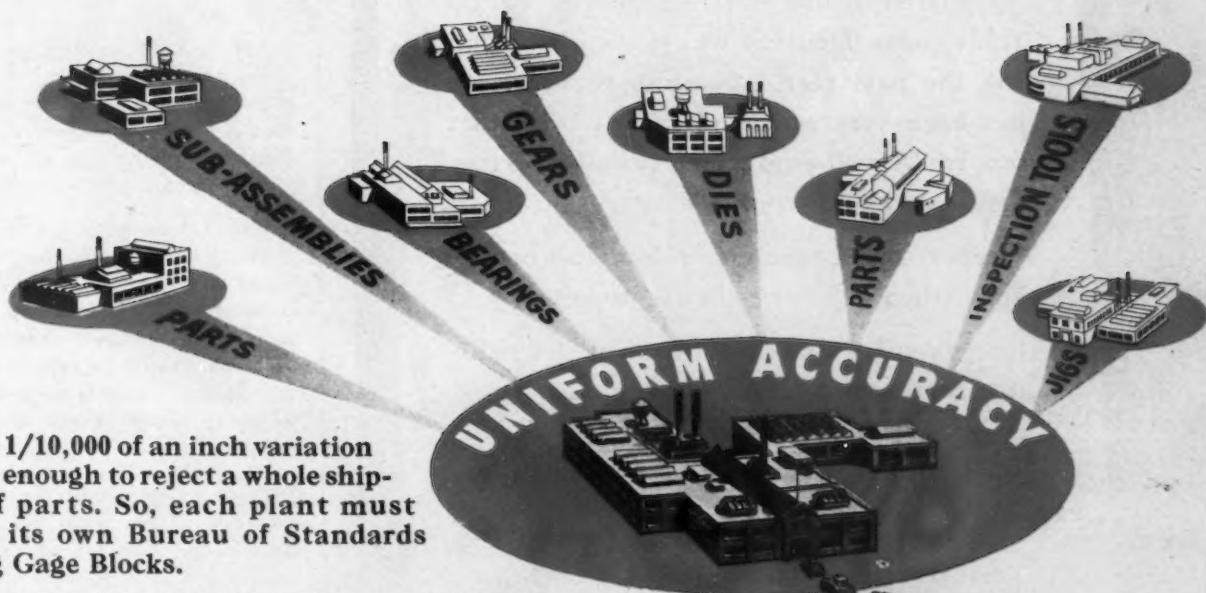
A warehouse may replace any general product with any other general steel product of the same type as long as it does not order for delivery in any quarter in excess of 150 per cent of its base tonnage of any product. If a warehouse has a base tonnage in cold rolled of 500 tons, it could under no conditions order more than 750 tons for delivery in any quarter. Sales of any general steel product could be used to support an order for cold-rolled—but only up to the 750 tons in this case.

Three orders are received in a single day from one customer. Two go to the same destination, the third is to be shipped to a different place. Should all three orders be grouped in figuring quantity deduction or in determining whether total order exceeds 39,999 lb.?

No, only the two orders specifying

THE FOUNDATION FOR UNIFORM MEASUREMENT

DO-ALL Gage Blocks



Today 1/10,000 of an inch variation in size is enough to reject a whole shipment of parts. So, each plant must become its own Bureau of Standards by using Gage Blocks.

The use of Gage Blocks makes possible interchangeability of parts made at different times and in different plants.

Each DO-ALL set consists of 81 basic blocks, which assemble into any one of a hundred thousand precision sizes to check other gages, dies, micrometers, jigs, fixtures, parts, etc.

WORKING SET, accurate to 8 millionths of an inch \$295.00

INSPECTION SET, accurate to 4 millionths of an inch \$350.00

LABORATORY SET, accurate to 2 millionths of an inch \$1450.00

**Recommended for use in a room with temperature controlled at 68° F.*

DO-ALL GAGE INSPECTION LABORATORY, including Inspection Set of Gage Blocks \$975.00



Checking a 6" micrometer



**FREE
SOUND SLIDES**

The care and use of Gage Blocks is one of the least understood phases of production. The DO-ALL man in your locality will gladly bring his portable projector and show a series of instructive slides to your Tool Room, Inspection and other Departments.

May we send you the inside story of DO-ALL Gage Blocks?

SAVAGE TOOL COMPANY

Dept. RA. Savage, Minnesota

DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on DO-ALL Gage Blocks, Surface Grinders, Contour Machines, Band Saws and Files.

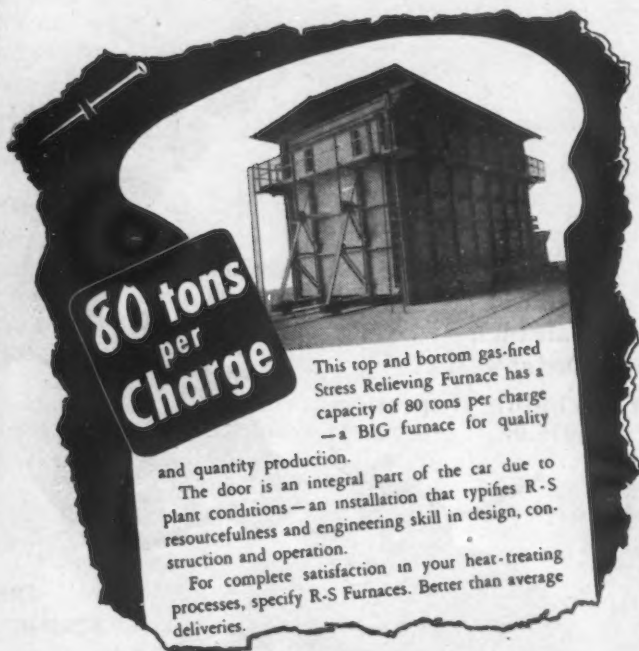


A Repeat Order Based on Performance and Delivery

One year ago, the Stress Relieving Furnace illustrated below was announced in the trade press. Delivery was prompt and during the past year, operating performance has been very satisfactory. The operators report, "A well-engineered installation that has given us no trouble whatsoever."

A repeat order resulted, a common occurrence when R-S Furnaces are installed.

Here, then, is tangible "proof of the pudding." Smaller R-S Furnaces for any heat treating service are equally satisfactory. You can always bank on R-S Furnace performance.



FURNACE DIVISION
R-S PRODUCTS CORPORATION
4524 Germantown Avenue • Philadelphia 44, Pa.

ANNEALING CONVECTION CAR HEARTH ROTARY HEARTH
CONTINUOUS CONVEYOR SALT BATH FORGING METAL MELTING
PLATE AND ANGLE HEATING

R-S Furnaces of Distinction
BUY WAR BONDS

NEWS OF INDUSTRY

delivery to the same location should be grouped—the third is a separate order. (Source: Both in Appendix F and Appendix G of RPS 49, OPA emphasizes that only orders received in one day for shipments "to one destination" need be combined.)

Is there any quantity limitation on an MRO order placed with a warehouse?

No, if the order is for less than 40,000 lb. Of course, the customer using the MRO symbol is limited by the terms of CMP Regulation No. 5. You can accept his order unless you know or believe that he is exceeding his permitted MRO quantity limits.

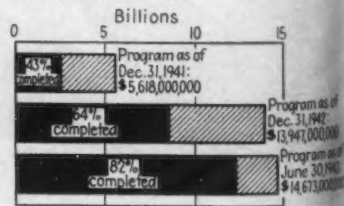
Item 620 on page 2 of Form WPB-2888 (PD-83) calls for a subtotal based on deliveries on orders bearing claimant agency allotment numbers. Instructions indicate that Items 600-616 should be added together to obtain the subtotal. This leaves out Item 617 which is titled "Class B Products." Is this an error?

Yes, and it will be corrected when the form is reprinted. In the meantime, when you submit these forms, add Item 617 along with Items 600-616 to obtain Item 620.

Prime plates are sheared to length only, five feet and longer. No shearing charge is allowed. How can a warehouse handle this transaction in order to receive compensation for shearing?

Sell the material unsheared and make a service charge for shearing. Two invoices should be used—one for the unsheared material, the other for the shearing. There will be a ceiling on your charge for shearing. That ceiling will be your March, 1942, price for a comparable service. If you didn't perform such a service at that time, apply to the nearest OPA office for a price determination. You probably will be permitted to charge actual labor cost, at least.

U.S. BUILDS ITS WAR PLANTS GOVERNMENT FINANCED INDUSTRIAL CONSTRUCTION AND DELIVERY OF EQUIPMENT



Each bar represents total program since June 1940

MORE THAN A MATCH



FOR ANY
BILLET
GRINDING
JOB

Electro BILLET GRINDING WHEELS

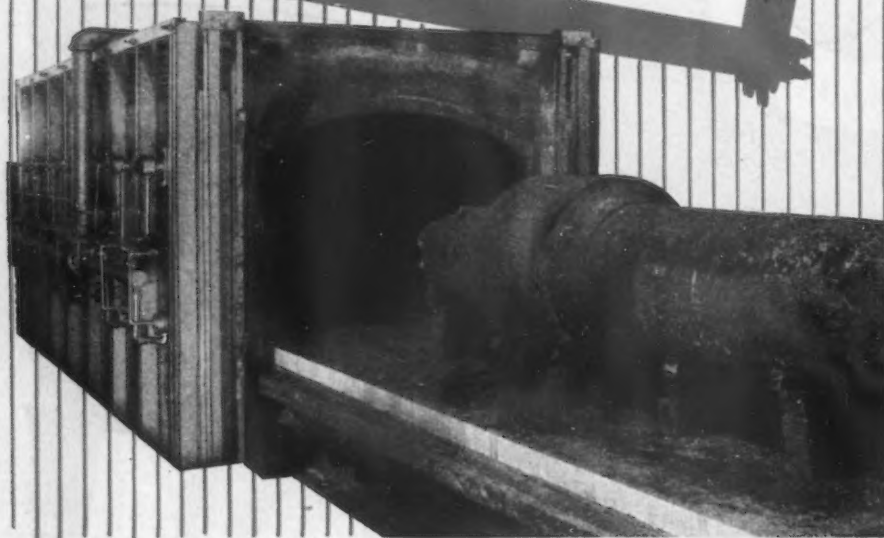
- MORE RAPID METAL REMOVAL
- TOUGHER AND MORE DURABLE—ruggedly constructed and heat resistant
- MORE UNIFORM QUALITY and DEPENDABILITY
- AVAILABLE FOR PROMPT DELIVERY

ELECTRO REFRACTORIES AND ALLOYS CORP.

EXECUTIVE OFFICES: VARS BUILDING, BUFFALO 2, N. Y.

Manufacturers of Crucibles, Alloys, Stoppers, Refractories, Grinding Wheels

WHERE
performance
MUST BE RIGHT—
WITH PRECISION CONTROL
OF FASTER HEAT,
UNDER YOUR WARTIME
OPERATING CONDITIONS



SWINDELL

HIGH TEMPERATURE
CAR-TYPE FURNACES

LET US CONSULT
ON YOUR PRESENT
FURNACE PROBLEMS

SWINDELL-DRESSLER Corporation

DESIGNERS AND BUILDERS OF MODERN INDUSTRIAL FURNACES
PITTSBURGH, PA.

Simplified Contract Termination Asked

New York

• • • Simplified and practical methods for terminating war contracts are needed very much, speakers emphasizing here recently at the annual meeting of the Controllers' Institute of America.

C. L. Collens, President of Reliance Electric & Mfg. Co., advocated a single, overall claim by each company to be rendered direct to the Government. Steps which International Harvester Co. and its subcontractors took at their numerous plants this year in the termination of a huge contract for Army tanks were outlined by C. E. Jarchow, vice president of International.

John D. Grayson, controller of the Hazeltine Electronics Corp., said his company received an abrupt cancellation from the Signal Corps on June 24, 1942, only about two months after the "letter of intent" covering the contract was signed. "We have not yet received payment for the cancellation," he added.

At the session on renegotiation of war contracts, problems of the machine tool industry were outlined by James Y. Scott, president, Van Norman Machine Tool Co., Springfield, Mass.

Distribution Conference to Discuss Post-War Business

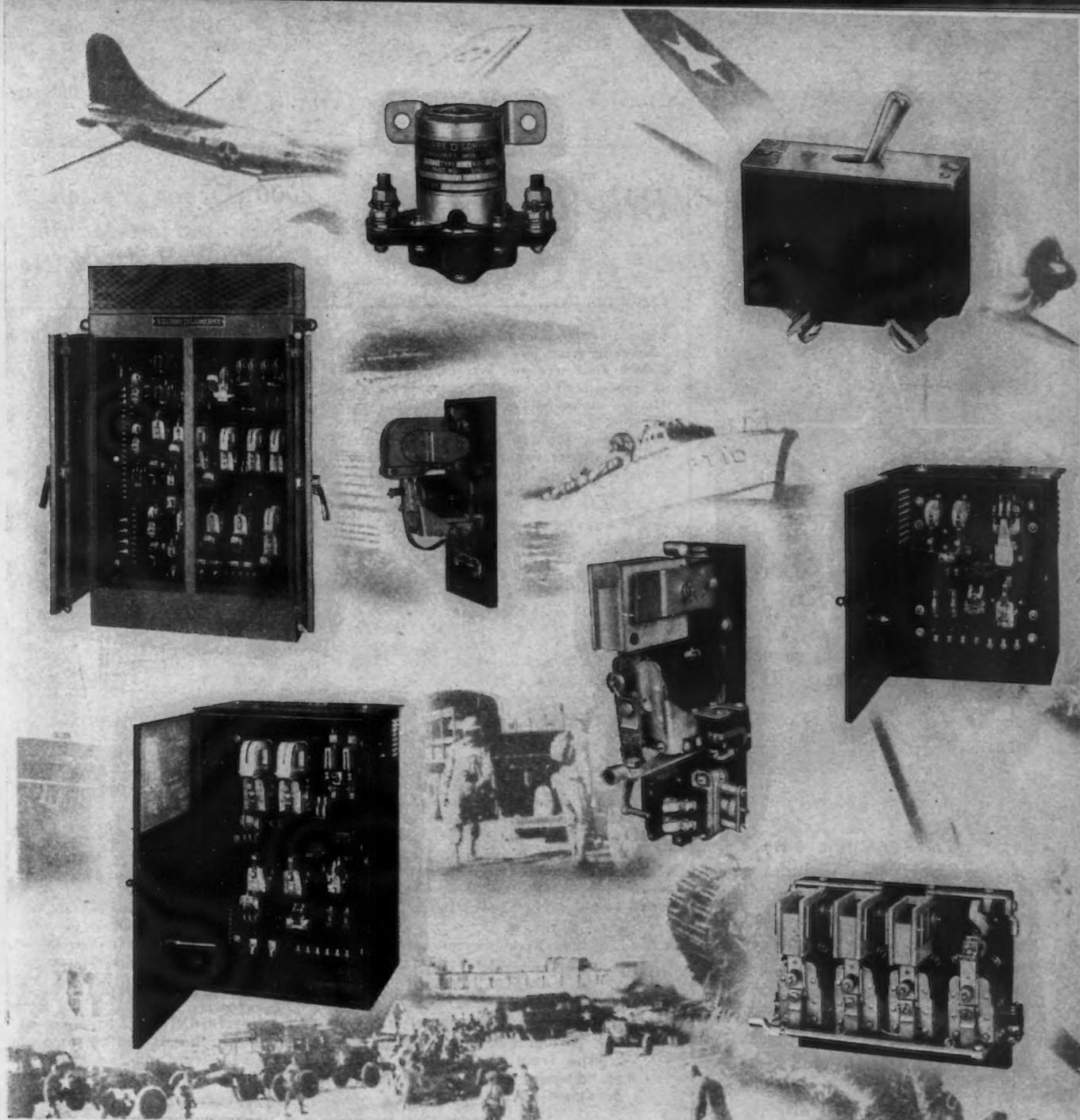
• • • The Boston Conference on Distribution is holding its fifteenth annual meeting at the Hotel Statler, Oct. 18 and 19 in Boston. Planning for post-war business will be highlighted by the speakers who include David E. Grant, Foreign Counsel, Pan American Airways, Inc., and R. V. Fletcher, vice-president, Association of American Railroads. In his talk, Mr. Grant will discuss our future trade relations with Latin-American countries regarding air transport.

OPA Advisory Group Named from Boiler Industry

• • • Six furnace and heating boiler parts industry executives have been appointed by OPA to serve on the Repair and Conversion Parts Industry Advisory Committee.

Members of the committee are:

William L. Healey, Waverly Heating Supply Co., Boston; Henry K. Krekel, Stove Mfrs. Corp., Newark, N. J.; C. B. Magrath, Northwestern Stove Repair Co., Chicago; John H. Oswald, H. C. Oswald Supply Co., New York; H. F. Randolph, International Heater Co., Utica, N. Y.; Harley H. Smith, United States Radiator Corp., Washington.



WHAT ARE YOUR D. C. CONTROL REQUIREMENTS?

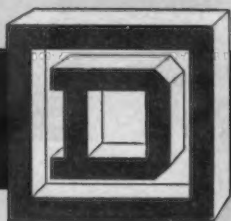
Whatever your D. C. control problem, a Square D Field Engineer will welcome an opportunity to help you. His background of practical experience and Square D's *three complete lines* of D. C. control most likely will provide an effective solution.

HEAVY DUTY CONTROL up to 600 volts and 300 amperes is furnished for machine tools and general industrial applications. Available components include contactors and timing relays, control relays, field relays, overload relays, and Edgerest resistors.

From these heavy duty units, marine control is also assembled to meet AIEE marine specifications.

ELECTRIC TRUCK CONTROL devices are built for voltages up to 115. Contactors, timers and relays are front connected for mounting on steel panels.

LOW VOLTAGE D. C. control devices have a wide range of applications on aircraft, tanks, boats, trucks and other portable or mobile equipment. Contactors, relays, push buttons, manual switches and circuit breakers are available up to 24 volts.



ELECTRICAL EQUIPMENT

KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

DETROIT

MILWAUKEE

LOS ANGELES

A BLADE FOR ANY METAL-SAWING JOB



The STAR line of Hack Saw Blades includes a blade for any type of metal sawing. For high-speed cutting, the "Moly" Type* — the original molybdenum alloy blade — is recommended. It can be recognized by its gold finish with the name STAR in black. For light materials and awkward sawing jobs your choice should be the STAR Unbreakable Special Flexible Blade. This all-over black blade cuts like an all-hard. Its flexibility eliminates breakage and tooth stripping.

STAR has just issued a new catalogue covering the complete line of Hack Saw Blades, Frames, Power Saws, Band and Contour Saws.



CLEMSON BROS.

Incorporated
MIDDLETOWN, NEW YORK

*T. M. Reg.—Blades bearing the name "Moly" are made only by Clemson Bros., Inc. and affiliated companies.

Makers of Hack Saws, Frames, Band Saws and Power Saws.

Briefly Told—

8000 Ocean Vessels Repaired in 6 Months; Other Industry News

• Repairs were completed on more than 8000 ocean-going steam and motor merchant vessels of 1000 gross tons and over during the first six months of 1943, the War Shipping Administration announced recently on the basis of tabulations just completed. The total does not include merchant type ships owned or under bare-boat charter to the United States Army or Navy.

• Bolstered by a 30 per cent increase in factory payrolls, August trade indices took a sharp upturn as compared to a year ago, the Chicago Association of Commerce states.

• A new aluminum forging project, production of a 96½-in. propeller blade, has been assigned to Chevrolet Motor Div., for production in a Michigan plant. While no announcement has been made of the type of plane requiring a blade of such dimensions, it may be assumed that the plane is of the super bomber or cargo plane class.

• Asserting that only one plant out of every eight has an adequate safety program, C. O. Cozzens, vice-president of the American Optical Co., announced recently that U. S. industry is currently losing or repairing 200,000 eyes a year at an annual cost of \$50,000,000. Industrial eye accidents are responsible for an annual loss of 8,000,000 man days, he said.

• Two 16-mm. Kodachrome sound films are available on a loan basis from the

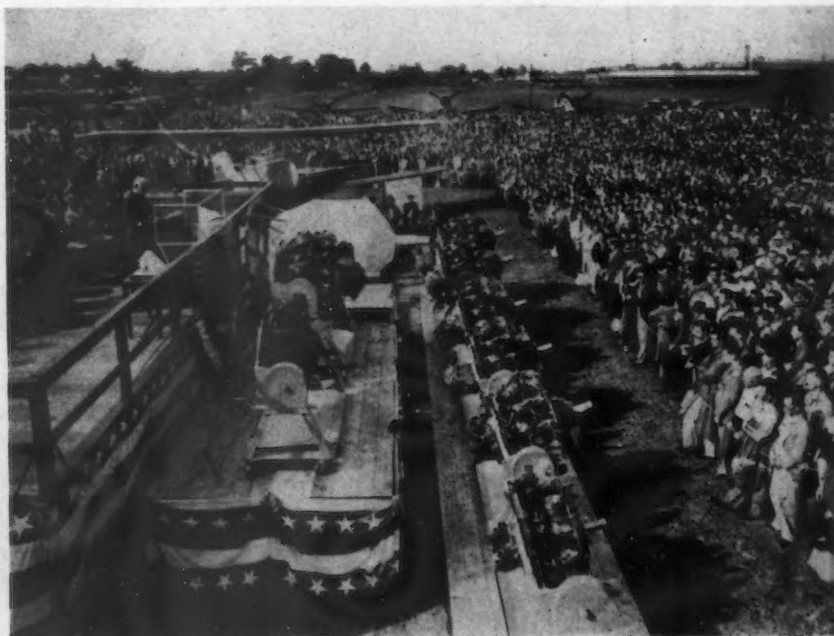
Federal Products Corp., 1144 Eddy Street, Providence. The first, entitled "The Dial Indicator," explains dial indicator mechanisms and the principles of precision measurements, the meaning of tolerances and how they are applied to mass production. The second film is "Dial Indicator Gages."

• Production of 0.30-cal. bullet cores by Willys-Overland Motors, Inc., has been increased 550 per cent during the past three months, it was announced recently. Although unable to reveal exact figures, Marvin J. Alef, manager of the bullet division, explained that output of the armor-piercing core this September is nine times greater than that of September, 1942, and half again as large as the volume turned out in the last six months of the year.

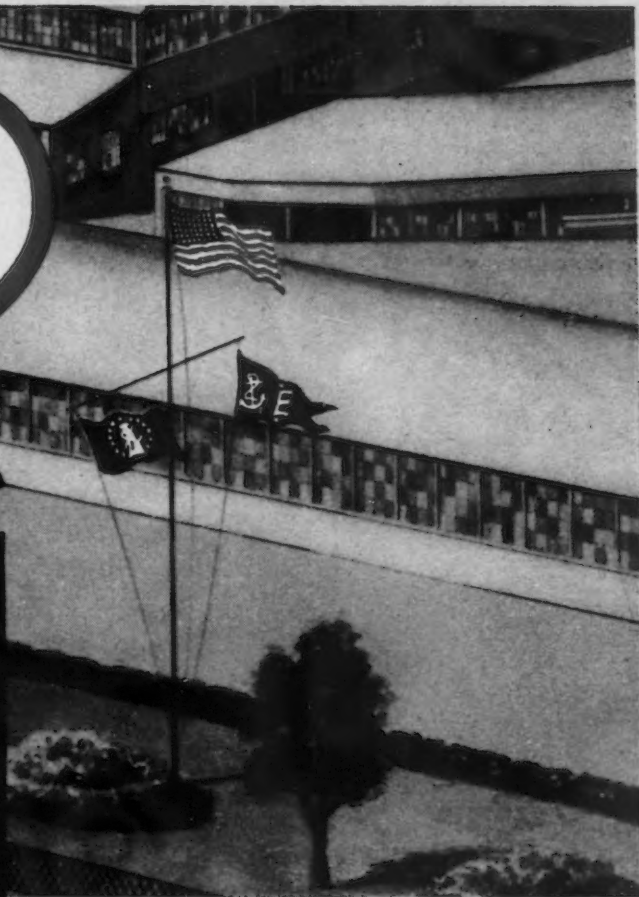
• The regional director and the state board of directors of the Michigan Division of the Smaller War Plants Corp. have resigned in a body, declaring that despite outlay of "diligent effort, substantial expense and much manpower" the SWPC has failed to "produce results beneficial to the war effort or to small industry."

• The annual report of the CIO-United Automobile Workers' Union, released late in September, shows an average of 715,382 monthly dues paying members, firmly establishing the UAW as the largest union in the

DELIVERING THE GOODS: Citizens from Hartford, Conn., turn out for the ceremonies celebrating the shipment of the 100,000th airplane engine from the Pratt & Whitney plant. In front of the speaker's stand are a new secret engine (the 100,000th one) and the first motor produced by the company.



Working and Saving Keep Them Waving



THREE TIMES WON FOR EXCELLENCE IN WAR PRODUCTION

Richard Kauzlaurich, husky machine operator, topped the winners in 14 other departments with a work record average of 10 hours and 48 minutes nightly since the first of the year. To him went the honor of hoisting the Navy E flag awarded for the third time to the employees and management of the Union Wire Rope Corporation. To him (and his 3 year old son, Richard, Jr.,) went the congratulations of Rear Admiral Alex M. Charlton, U.S.N., Inspector of Navy Material, Chicago.

In praising the company's production record, Rear Admiral Charlton said the wire rope it has made for the Navy in recent months would stretch from the Union Wire Rope plant to Guadalcanal, take a hitch around a palm tree and extend on to Australia.

Union Wire rope employees are pledged to save to keep the Treasury Minute Man burgee flying. The men and women of Union Wire Rope are also working day and night to produce wire rope so vital to winning the war.

• To Help All Industry . . . SAVE Wire Rope . . . Keep It WORKING . . .

Your wire rope still faces a tough assignment. It must continue to work overtime, often under overload, with chances of replacement limited. Why? Because modern warfare is dependent upon wire rope to hoist, handle, load and unload vast tonnages of war materials.

To help you save wire rope and keep it working, we offer free for the asking, 5 booklets, entitled:

1. Splicing Wire Rope, 2. Socketing Wire Rope, 3. Correct

5 BOOKLETS
FREE!



Handling of Wire Rope, 4. Lubrication of Wire Rope. These give you specialized information. **Rope Dope (5)** amplifies on abuses of wire rope and their remedies. All are written in non-technical terms. Put into practice, the information these booklets contain will stand you in good stead now and post-war.

UNION WIRE ROPE CORPORATION
2158 MANCHESTER AVE. KANSAS CITY 3, MO.

union Wire Rope corporation

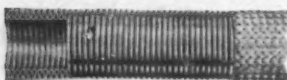


REX-WELD *Helps Guard* HIS LIFE

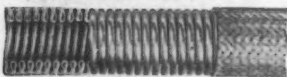
REX-WELD Flexible Metal Hose has met the critical test that demands only the best materials for our combat planes. More and more bombers, fighters and interceptor-pursuit ships are being Rex-Weld equipped.

REX-WELD's war service is not confined to the planes themselves. In the steel mills and munition factories, on the production and assembly lines, everywhere that war-worthy flexible connections are needed, REX-WELD is rendering vital service.

There are specific reasons for this. REX-WELD is a specially constructed flexible metal tubing. It is fabricated from strip metal by a precision autogenous welding process that produces uniform, stronger wall structure plus extreme flexibility. REX-WELD stands up under high pressures, high and low temperatures, extreme contraction and expansion. It is seep-proof to gas, water, oil, air and searching fluids.



Type RW-81
(annular corrugations)



Type RW-91
(helical corrugations)

Available in continuous lengths to 50 ft. Both Steel and Bronze. 3/16" I. D. to 4" I. D. inc. Pressures to 14,500 p.s.i. Temperatures to 1000° F.

Write for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois

NEWS OF INDUSTRY

country. Total income for the 14-month period ending June 30, 1943, amounted to \$3,313,545. Total assets as of June 30 were \$1,622,623.

• Commercial and most industrial users in Canada of lake-carried United States coal will not be permitted to obtain coal in excess of their winter needs, the Department of Munitions and Supply announced. Under a new order by Coal Controller E. J. Brunning, industrial and commercial users, except by permit, will be prohibited from accepting delivery of lake-carried U. S. coal in quantities in excess of what they require to build their present stock piles to last until May 15.

• Some 200 of the 300 ocean-going cargo ships on order in Canada have been launched and it is proposed to gradually reduce the building of these ships in Canadian yards, according to reliable sources. It is believed that some labor now engaged in freighter construction can be used to greater advantage elsewhere.

• Canada's external trade for the month of August was the second largest in the history of Canadian commerce, totaling \$444,240,556, being exceeded only in July of this year with total of \$457,409,956, the Dominion Bureau of Statistics reported. Exports to the United States were just about double those of a year ago.

• Milwaukee war bond drive was given considerable impetus with the news that Allis-Chalmers was subscribing \$11,000,000 for the local campaign, part of an \$18,000,000 allocation among its various plants.

• The name of the former Boyle Mfg. Co., sheet metal fabricating subsidiary of the U. S. Steel Corp. on the Pacific Coast, has been changed to United States Steel Products Co. The new company has also purchased the Petroleum Iron Works Co. subsidiary of American Republic Corp. with manufacturing plants near Sharon, Pa., and at Port Arthur and Beaumont, Texas.

• Five heavy chemical distributors will become a part of the Diamond Alkali Sales Corp. on October 1, in order to more closely correlate the Diamond Alkali field service, sales and warehousing. The companies are: Consumers Chemical Co., Philadelphia; Tri-State Chemical Co., Inc., Memphis, Tenn.; Sunshine Soda Co., Inc., Cleveland; Central West Chemical Co., Omaha, Neb., and Bad-eye Soda Products Co., Cincinnati.

• A signal honor has been conferred upon the Wheeling Steel Corp. by the National Safety Council's War Production Fund to Conserve Manpower in a citation recently received by the company.

• Apparently as the result of surplus ore stocks, the Raimund ore mine near Birmingham of Republic Steel Corp. will be closed down Oct. 16 for an indefinite period. Most of the 750 men to be affected will be given employment in the corporation's other mines, ore or coal. The War Manpower Commission is in a position

H O U G H T O N ' S

"Facial treatments" for steel

For surface protection . . . **RUST PREVENTIVES**



Steel and steel parts shipped over the seven seas require protection against rust, the enemy of ferrous metals. Procedures today have been standardized; "specs" are provided which Houghton rust preventives meet and exceed. These products include thin-film hard drying types, waxy coatings, water-displacing types, and medium or heavy grease varieties.

For improved appearance . . . **BLACKENING**



HOUGHTO-BLACK, the low-temperature blackening bath that adds lustre and protection to bare metal, is the second type of "facial" for steel. Its finish is durable and does not alter dimensional sizes. Write for the Houghto-Black folder.

For toughness . . . **CARBURIZING**



Houghton's PERLITON Liquid Carburizer is not merely a "facial", of course. Its penetration is deep, uniform and rapid. The carbon case it provides is similar to that obtained from pack-hardening. Houghton also provides energized solid materials in all meshes for pot carburizing.

"Save the surface and you save all" applies to steel as well as to wood. To protect your steels against either weather or wear, investigate these Houghton products of research which have helped the metal industry for three-quarters of a century.

E. F. HOUGHTON & Co.

Heat Treating and Metal Working Products

PHILADELPHIA

CHICAGO

DETROIT

SAN FRANCISCO

TORONTO

SINTEEL

POWDER METALLURGY PRODUCTS

"METAL POWDERS
pressed into
desired shape, sin-
tered at tempera-
tures to meet phys-
ical and electrical
specifications."

- **ELIMINATE** waste and scrap
- **RELEASE** machine tools
- **INCREASE** production capacity
- **LOWER** manufacturing cost

**AMERICAN
ELECTRO METAL CORPORATION**

320 Yonkers Ave.

Yonkers, N. Y.

NEWS OF INDUSTRY

tion to furnish employment for the remainder in this immediate area.

• Domestic bookings of electric industrial trucks and tractors during the month of July, 1943, totaled 302 units, figures just released by the Industrial Truck Statistical Association indicate. The net value of chassis only booked during July totaled \$1,272,064 compared with \$1,218,176 in June.

• The Army Air Forces and Minneapolis-Honeywell Regulator Co. have joined in revealing one of the best kept secrets of the war, the use of electronically-controlled automatic pilots which provide a stable platform for high altitude precision bombing. The instrument was developed by W. J. McGoldrick, vice-president in charge of aeronautical engineering of the Minneapolis-Honeywell company, together with the company's staff of technicians and engineers.

• With \$16,530,000 in additional or expanded new plants authorized for construction during September, Chicago's total capital investment in additional industrial facilities in the first nine months of 1943 has been brought to \$143,601,937, the Chicago Association of Commerce reports. The September figure was made up in great part by a large aircraft parts project, the balance coming from expansions of a large number of small plants.

• Production rates on nearly all war products, particularly on aircraft requirements, have been steadily advancing at Briggs Mfg. Co., it was indicated in a recent report. Shipments of bomber turrets during the first three-quarters of 1943 exceeded those for the entire year of 1942. Tank hulls produced thus far in 1943 represent twice the volume as in the entire 1942 year.

• Delivery of the 10,000th Curtiss (P-40) fighter plane to the U. S. Army Air Forces by Curtiss-Wright Corp. since July, 1940, was announced recently with the approval of the War Department by B. S. Wright, vice-president of the organization in charge of its entire warplane manufacturing.

• The fourth American fighting ship to be named in honor of Commander William Barker Cushing, the first American naval officer to prove the efficacy of the torpedo, was launched Sept. 30 at the Mariners Harbor, Staten Island, yard of Bethlehem Steel Co. The new vessel, a destroyer, was sponsored by Commander Cushing's daughter, Miss Katharine A. Cushing, of Fredonia, N. Y.

• The propeller division of Nash-Kelvinator Corp. is now one of the world's largest producers of airplane propellers, it was announced recently.

• As part of its \$1,000,000 extension program, Hull Steel Foundries, Ltd., Hull, Que., has just completed a plant service building which affords the maximum in comforts and convenience for the men working in the foundry. A feature of the room will be a public address system over which will come radio news and music.

TALON'S ELECTRIC WELDED STEEL TUBING

MEETS THESE SPECIFICATIONS

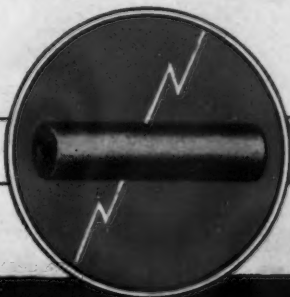


SIZES FROM $\frac{5}{8}$ " O. D. TO 4" O. D.
UP TO 40' IN LENGTH

To meet the needs of industry for minimum weight and maximum strength, Talon's Electric Welded Steel Tubing is manufactured from flat-rolled strip steel and tested beyond the required limits of standard specifications. Each coil of strip must meet Talon's rigid requirements for accuracy to chemical and physical properties, gauge, width and finish. Safety, ease of fabrication, light weight, uniform wall thickness and diameter, and concentricity are thereby assured.

During and after the cold-forming operation, each length is subjected to critical inspection, and every foot of pressure tubing is hydrostatically tested. Grain structure of wall and weld is homogeneous—no extra metal is added in welding. Controlled atmospheric annealing improves physical properties and produces a scale-free finish. Talon's Electric Welded Steel Tubing in sizes from $\frac{5}{8}$ " to 4" O. D. is available for prompt delivery in lengths up to 40 feet.

PRESSURE



MECHANICAL

TALON . . INC.

STEEL TUBE DIVISION

OIL CITY, PENNA.

Amsco Manganese Steel Chain Gave Nine Times the Life of Mild Steel Chain

Among a number of worthwhile applications for "the toughest steel known" in steam power plant equipment is the ash-conveyor drag chain shown in picture 722. The Chief Engineer wrote:

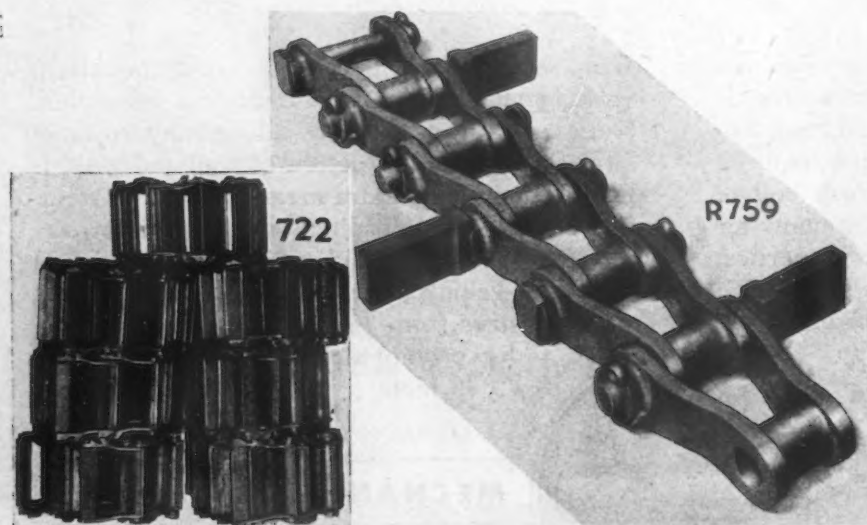
"Our conveyor handles the ashes from six 800 h.p. boilers, moving them 200 feet. The bottom of the conveyor trough is made of hardened concrete in which is embedded a grating six bars wide made up of cast manganese steel bars.

"The first drag chain used was made of mild steel and had to

be replaced after nine months.

"The Amsco manganese steel chain (408' of H-drag type) was replaced after seven years' service, six hours a day. During this period the maintenance was very low; and the manganese steel grate bars showed equally good performance."

Another type of clinker drag chain appears in R-759. Other successful power plant uses for manganese steel, such as crusher and pulverizer parts, gears and sprockets, are described in Bulletin 543-G. Send for your copy.



Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN
Brake Shoe
COMPANY

NEWS OF INDUSTRY

Post-War Junking Of War Plants Cited

Washington

• • • Secretary of Commerce Jesse Jones told the House Small Business Committee that some of the war plants in which the government has invested more than \$7,000,000,000 will have to be "junked" after the war.

Mr. Jones said, however, that the major portion of losses would probably be restricted to properties now being used to manufacture ordnance and chemicals. These, he said, represent "only a small percentage" of the Reconstruction Finance Corporation's \$7,029,000,000 investment in Defense Plants Corp.

"Many of these plants necessarily will have to be junked," he testified at a committee hearing, "but others now being used for manufacture of war equipment can be and should be reconverted and operate by private enterprise, which must be given good terms to facilitate purchasing."

Mr. Jones then explained that while users of government defense plants generally retain purchase options at cost less normal depreciation, "these options will probably never be taken up because of high wartime cost of construction."

He listed RFC's war investments in addition to the Defense Plants Corp.'s holding as \$364,000,000 for Defense Supplies Corp., \$434,000,000 for Metal Reserves Corp. and \$120,000,000 for Rubber Reserves Corp.

U. S. Reveals Alaskan Gasoline Pipe Line in Service

• • • The existence of a gasoline-distribution pipe line stretching for 1000 miles from Skagway in southeastern Alaska to Fairbanks deep in the interior, and supplying huge quantities of gasoline to United States airbases in Canada and Alaska, is revealed officially for the first time.

The line extends from Skagway through Whitehorse, Y. T., and thence to Fairbanks. It was built by U. S. Army engineers last year and has been in use since January.

The Standard Oil Co. of Alaska recently was formed here to distribute the gasoline and operate the system for the army on a one dollar a year plus cost basis.

The project removes a great burden from the Alaska railroad which formerly carried all gasoline to Fairbanks.

Correlated Technical Program

(CONTINUED FROM PAGE 61)



A.W.S. Session on Cutting, Hotel Morrison.
Welding of Railroad Transport Equipment, by C. Dreutzler, Electro-Motive Corp., A.W.S. Railroad Session, Hotel Morrison.
Evaluation of Weldability by Correlation of Electrical Constants, by Victor Paschkis, Columbia University, A.W.S. Weldability Session, Hotel Morrison.

6:30 P.M.

Joint Regional and Divisional Dinner, A.I.M.E., Hotel Sherman.

7:30 P.M.

Educational Session, A.W.S.: General Electric Film on Atomic Hydrogen Welding and an address on "Welding in Ordnance Construction," by Col. S. B. Ritchie, Chief of the Service Branch of the Chief of Ordnance Office, A.W.S., Hotel Morrison.

8:30 P.M.

War Production, Conservation, and Post War Planning Meetings, A.S.M., Palmer House.
 3. *Non-destructive Inspection Tests; Appraisal of surface finishes, X-ray and Magnaflex inspection and interpretation.*
 4. *Purchase of Steel on the Basis of Expected Performance.*

Tuesday Oct. 19

9:00 A.M.

The Effect of Varying Amounts of Martensite Upon the Isothermal Transformation of Austenite Remaining after Controlled Quenching, by H. J. Elmen-dorf, American Steel & Wire Co., A.S.M., Palmer House.
High Speed Testing of Mild Steel, by J. H. Hollomon and C. Zener, Watertown Arsenal, A.S.M., Palmer House.
A Study of the Nitriding Process—I. Effect of Ammonia Dissociation on Case Depth and Structure, by Carl F. Floe, The Nitralloy Corp., A.S.M., Palmer House.
Hardenability and Jominy Tests, three or four papers, A.I.M.E. Iron and Steel Division, Hotel Sherman.
Copper and Copper-Rich Alloys, three or four papers, A.I.M.E. Institute of Metals Division, Hotel Sherman.

9:30 A.M.

Flash Welding of Alloy Steels, by C. M. Manzer, General Electric Co., A.W.S. Session on Resistance Welding, Hotel Morrison.
Ordnance Flame Hardening, by S. Smith and J. G. McIlhiney, Air Reduction Sales Co., A.W.S. Session on Flame Hardening and Hard Facing, Hotel Morrison.
Welding in Ship Construction, by H. A. Matis and A. M. Unger, Pullman, Standard Car Mfg. Co., A.W.S. Session on Ships, Hotel Morrison.
Welded Steel Tubing—Quality Control and Application, by R. D. Malm, Clayton Mark & Co., A.W.S. Session on Tubing, Hotel Morrison.
Steel Rope Wire Drawing Practices, by John C. Aiken, Jones & Laughlin Steel Corp., W.A., LaSalle Hotel.

9:45 A.M.

Martensite Reactions in Alloy Steels, by Peter Payson and Charles H. Savage, Crucible Steel Co. of America, A.S.M., Palmer House.
The Effect of Heat Treatment and Carbon Content on the Work Hardening Characteristics of Several Steels, by John H. Hollomon, Watertown Arsenal, A.S.M., Palmer House.
The Action of Carbonate Catalysts in the Carburation of Steel, by T. C. Fong

and R. A. Ragatz, University of Wisconsin, A.S.M., Palmer House.
Hardenability and Jominy Tests, A.I.M.E. Iron and Steel Division, Hotel Sherman.
Copper and Copper-Rich Alloys, A.I.M.E. Institute of Metals Division, Hotel Sherman.

10:15 A.M.

The Spot Welding of Heavy Gages of Carbon and Alloy Steels, by John C. Barrett, Taylor-Winfield Corp., A.W.S. Session on Resistance Welding, Hotel Morrison.
Machine Welded Metal Tubing, by G. C. Gridley, Mechanics Universal Joint Division of Borg-Warner Corp., A.W.S. Session on Tubing, Hotel Morrison.
Hard Facing in the War on Wear, by J. A. Gallaher, Haynes Stellite Co., A.W.S. Session on Flame Hardening and Hard Facing, Hotel Morrison.
Prefabrication of Welded Ships in a Structural Steel Plant, by E. T. Bliz and J. C. Arntzen, Mississippi Valley Structural Steel Co., A.W.S. Session on Ships, Hotel Morrison.

10:30 A.M.

Influence of Nickel, Molybdenum, Cobalt, and Silicon on the Kinetics and Ar⁺ Temperatures of the Austenite to Martensite Transformation in Steels, by H. H. Chiswick, Battelle Memorial Institute, and A. B. Greninger, University of Chicago, A.S.M., Palmer House.
The Tensile Properties of Alloyed Ferrites, by C. E. Lacy, International Nickel Co., and M. Gensamer, Carnegie Institute of Technology, A.S.M., Palmer House.
The Isothermal Transformation of Case-Carburized S.A.E. 4815, by J. R. Cruciger and J. R. Vilella, United States Steel Corp., A.S.M., Palmer House.
Hardenability and Jominy Tests, A.I.M.E. Iron and Steel Division, Hotel Sherman.
Copper and Copper-Rich Alloys, A.I.M.E. Institute of Metals Division, Hotel Sherman.
Graphical Solutions of Wire Mill Mathematical Problems, by E. J. Crum, Bethlehem Steel Co., W.A., LaSalle Hotel.

11:00 A.M.

The Spot Welding of Carbon Steels S.A.E. 1020, S.A.E. 1035, and S.A.E. 1045 in the 0.040-in. Thickness, by Wendell F. Hess, Rensselaer Polytechnic Institute, A.W.S. Session on Resistance Welding, Hotel Morrison.
Oxy-Acetylene Tube Welding, by A. C. Weber, Laclede Steel Co., A.W.S. Session on Tubing, Hotel Morrison.
Hard Facing, by F. G. Jones, Wall-Colmonoy Corp., A.W.S. Session on Flame Hardening and Hard Facing, Hotel Morrison.
Control of Welding in Ship Construction, by R. W. Brendle, Tampa Shipbuilding Co., A.W.S. Session on Ships, Hotel Morrison.

1:30 P.M.

The Use of Lead Base Coatings as a Substitute for Zinc, by C. A. Kellogg, Continental Steel Corp., W.A., LaSalle Hotel.

2:00 P.M.

War Production, Conservation and Post War Planning Meetings, A.S.M., Palmer House.
 5. *Foundry Metallurgy—Melting methods, high strength cast irons and steels, centrifugal casting, and non-ferrous continuous casting.*
 6. *Special Alloy Additives in Steel Manufacture.*

7. *Powdered Metallurgy—Material and manufacture; physical properties; post-war possibilities.*

Joint Symposium on Cohesive Strength. Four technical papers and informal discussion, arranged by Maxwell Gensamer, Carnegie Institute of Technology, A.I.M.E., Hotel Sherman.

Why the Weld Recorder, by J. R. Fletcher and J. van den Beemt, E. G. Budd Mfg. Co., A.W.S. Session on Resistance Welding, Hotel Morrison.

Planning for Production Welding and Cutting in Modern Shipyards, by W. B. Bowen, Ingalls Shipbuilding Corp., A.W.S. Session on Ships, Hotel Morrison.

Fatigue Strength of Fillet Welded Joints, by W. J. Wilson, University of Illinois, A.W.S. Research Session, Hotel Morrison.

2:30 P.M.

Hydrogen Brittleness in Spring Steels, by R. R. Tatnall, Wickwire Spencer Steel Co., W.A., LaSalle Hotel.

2:45 P.M.

Joint Symposium on Cohesive Strength, A.I.M.E., Hotel Sherman.
Double Pressure Systems as Applied to the Resistance Welding Machine, by S. M. Humphrey, Taylor-Winfield Corp., A.W.S. Session on Resistance Welding, Hotel Morrison.
Thermit Welding in Maritime Commission Work, by J. H. Deppeler, Metal and Thermit Corp., A.W.S. Session on Ships, Hotel Morrison.
Some Notes on Evaluating the Weldability of Alloy Steels, by Lt. S. A. Herres, Watertown Arsenal, A.W.S. Research Session, Hotel Morrison.

3:30 P.M.

Joint Symposium on Cohesive Strength, A.I.M.E., Hotel Sherman.
Stored Energy Welding of Mild Steel, by J. M. Diebold, Yellow Truck & Coach Mfg. Co., A.W.S. Session on Resistance Welding, Hotel Morrison.
Longitudinal Welded Joints, by A. G. Bissell, Bureau of Ships, Navy Dept., A.W.S. Session on Ships, Hotel Morrison.
Investigation of a Normalizing Procedure to Improve the Grain Structure of Welds in Carbon-Molybdenum Pipe, by I. A. Rohrig, D. H. Corey, and Sabin Crocker, the Detroit Edison Co., A.W.S., Research Session, Hotel Morrison.

4:15 P.M.

Flash Welding of Nickel and High Nickel Alloys, by W. F. Hess and A. Muller, Rensselaer Polytechnic Institute, A.W.S. Session on Resistance Welding, Hotel Morrison.
Correlation of Structure and Strength of Spot Welds in Aluminum Alloys, by Dana Smith and F. Keller, Aluminum Co. of America, A.W.S. Research Session, Hotel Morrison.

8:30 P.M.

War Production, Conservation and Post War Planning Meetings, A.S.M., Palmer House.
 8. *Steelmaking Methods.*

Wednesday, Oct. 20

9:00 A.M.

Annual Meeting of American Society for Metals, 1943 Edward de Mille Campbell Memorial Lecture, by Dr. C. H. Mathewson, Professor of Metallurgy, Yale University, Ball Room, Palmer House.

9:30 A.M.

Fatigue Strength of Welded Aircraft Joints, by T. V. Buckwalter, Timken Roller Bearing Co., A.W.S. Aircraft Session, Hotel Morrison.

Modern Welding Methods for Copper and Copper Alloys, by J. J. Vreeland, Chase Brass and Copper Co., Inc., A.W.S. Non-Ferrous Welding and Brazing Session, Hotel Morrison.

Oxy-Acetylene Distribution Systems, by D. F. Guthrie and R. W. Stewart, Air Reduction Sales Co., A.W.S. Session on Piping, Hotel Morrison.

10:00 A.M.

Mordica Memorial Lecture, "The Wire Drawing Die," by Flint C. Elder, American Steel & Wire Co., W.A., LaSalle Hotel.

10:15 A.M.

The Spot Weldability of Low Carbon and Other Aircraft Steels, by L. C. Bibber and Julius Heuschkel, Carnegie-Illinois Steel Corp., A.W.S. Aircraft Session, Hotel Morrison.

Carbon Arc Welding of Naval Brass, by K. L. Walker, Foster Wheel Corp., A.W.S. Non-Ferrous Welding and Brazing Session, Hotel Morrison.

Large Welded Pipe Lines, by L. G. Christofferson, Chicago Bridge & Iron Co., A.W.S. Session on Piping, Hotel Morrison.

11:00 A.M.

Weldability Tests of Aircraft Structural Steels, by C. B. Voldrich and R. D. Williams, Battelle Memorial Institute, A.W.S. Aircraft Session, Hotel Morrison.

Aluminum Brazing Sheet—Fundamentals of Metal Flow, by M. A. Miller, Aluminum Research Laboratories, A.W.S. Non-Ferrous Welding and Brazing Session, Hotel Morrison.

Weldability of 27 per cent Chrome Steel Pipe, by R. A. Mueller, I. H. Carlson, and E. R. Seabloom, Crane Co., A.W.S. Session on Piping, Hotel Morrison.

12:00 Noon

Luncheon Meeting, Executive Committee, Institute of Metals Division, A.I.M.E., Hotel Sherman.

1:00 P.M.

Wire Association Luncheon, Speaker, Capt. A. J. Wellings, Chief of Navy Material Inspection, Navy Department, LaSalle Hotel. Motion Pictures Supplied by U. S. Navy.

2:00 P.M.

War Production, Conservation and Post War Planning Meetings, A.S.M., Palmer House.

9. *Surface Hardening*, including a discussion of gas carburizing, hard layers on tool steels, and differential hardening.

10. *Control of Quality by Inspection*: Precision instruments, personal equation, and statistical analysis of test results.

11. *Non-Ferrous Metallurgy—Post-war possibilities of aluminum, magnesium, copper, lead, and zinc.*

Symposium on Segregation in Steel, A.I.M.E. Iron and Steel Division, Hotel Sherman.

Technical Session on Physical Metallurgy, A.I.M.E., Institute of Metals Division, Hotel Sherman.

The Heliarc Welding of Magnesium Alloys as Used in Airplane Fabrication and Substitution for Critical Materials, by T. E. Piper, Northrop Aircraft, Inc., A.W.S. Aircraft Session, Hotel Morrison.

Symposium on Applicable Methods of Inspection of Arc Welding for: (1) Shipbuilding, by J. Lyell Wilson; (2) Structural, by R. B. Lincoln; (3) Pressure Vessels and Piping, by W. D. Halsey; (4) Aircraft, by J. B. Johnson; and (5) Machinery, by N. L. Mochel, A.W.S. Session on Inspection, Qualification, and Training, Hotel Morrison.

Bronze Welding in the Design and Maintenance of Forming Dies, by C. E. Swift, Ampco Metal, Inc., A.W.S. Session on Repair and Maintenance, Hotel Morrison.

2:45 P.M.

Fatigue Studies of Welded Test Triangular Structures with NE 8630 Steels, by A. J. Williamson, Summerill Tubing Co., A.W.S. Aircraft Session, Hotel Morrison.

The Job Shop—Past, Present, and Future, by F. W. Schakleton, Central Ohio Welding Co., A.W.S. Session on Repair and Maintenance, Hotel Morrison.

3:30 P.M.

Fabrication and Welding of Aircraft Exhaust Tubing, Manifolds, and Headers, by C. D. LaFond, Buhl Stamping Co., A.W.S. Aircraft Session, Hotel Morrison.

Maintenance of Tools and Equipment, by T. B. Jefferson, The Welding Engineer, A.W.S. Session on Repair and Maintenance, Hotel Morrison.

4:00 P.M.

Wire Association Annual Meeting, LaSalle Hotel.

4:15 P.M.

Metallic Arc Welded X-4130 Steel Tubing, by W. T. Tiffin, University of Oklahoma, A.W.S. Aircraft Session, Hotel Morrison.

General Problems of Training Welding Operators, by A. N. Kugler, Air Reduction Sales Co., A.W.S. Session on Inspection, Qualification, and Training, Hotel Morrison.

Reclamation of Tools by Low Temperature Brazing, by W. A. Johnson, International Harvester Co., A.W.S. Session on Repair and Maintenance, Hotel Morrison.

7:00 P.M.

Annual Smoker-Dinner, Wire Association, LaSalle Hotel.

8:30 P.M.

War Production, Conservation and Post War Planning Meetings, A.S.M., Palmer House.

12. *National Emergency Steels—Current and future use; leaner alloyed steels in post-war period.*

Thursday, Oct. 21

9:00 A.M.

Order Hardening: Its Mechanism and Recognition, by David Harker, General Electric Co., A.S.M., Palmer House.

Bright Gas Quenching of S.A.E. X-4130 Welded Aircraft Tubes, by Wm. Lehrer, Surface Combustion Corp., A.S.M., Palmer House.

The Stress Distribution at the Neck of a Tension Specimen, by P. W. Bridgman, Harvard University, A.S.M., Palmer House.

9:30 A.M.

Quality Control of Aircraft Spot Welding, by Nathan C. Clark, Lockheed Aircraft Research Laboratory, A.W.S. Aircraft Session, Hotel Morrison.

Automatic Arc Welding Solves Production Problems, by R. F. Wyer, General Electric Co., A.W.S. Production Session, Hotel Morrison.

War Emergency Codes for Welded Pressure Vessels, by E. R. Fish, Hartford Steam Boiler Inspection & Insurance Co., A.W.S. Session on Pressure Vessels, Hotel Morrison.

9:45 A.M.

Interrupted Quench and Isothermal Treatments of Precipitation Hardening Alloys: Introductory Notes, by R. H. Harrington, General Electric Co., A.S.M., Palmer House.

Some Effects of Heat Treatment on Low Alloy Titanium Steels, by G. F. Comstock, Titanium Alloy Mfg. Co., A.S.M., Palmer House.

Notched Bar Tensile Test Characteristics of Heat Treated Low Alloy Steels, by G. Sachs, J. D. Lubahn and L. J. Ebert, Case School of Applied Science, A.S.M., Palmer House.

Glass Insulation, Its Uses and Properties, by L. T. Russell, Owens-Corning Fiberglass Corp., W.A., LaSalle Hotel.

10:00 A.M.

The Application of Flash Welding in Airplane Construction, by C. B. Smith, Douglas Airplane Co., A.W.S. Aircraft Session, Hotel Morrison.

10:15 A.M.

Transition from Riveted Construction of Light Tanks, by William Osna and J. W. Sheffer, American Car & Foundry Co., A.W.A. Production Sessions, Hotel Morrison.

10:30 A.M.

The Effect of Time, Temperature, and Prior Structure on the Hardenability of Several Alloy Steels, by J. Welchner, E. S. Rowland, and J. E. Ubben, Timken Roller Bearing Co., A.S.M., Palmer House.

The Strength of Heat Treated Alloy Steel Bolts, by G. Sachs, F. S. Cole, and R. A. Roth, Case School of Applied Science, A.S.M., Palmer House.

Spot Weld Joint Efficiency for Aluminum Alloys, by C. W. Steward, Curtiss-Wright Corp., Research Laboratory, A.W.S. Aircraft Session, Hotel Morrison.

The Hammer Test for Welded Pressure Vessels, by C. O. Dohrenwend, Armour Research Foundation, A.W.S. Session on Pressure Vessels, Hotel Morrison.

11:00 A.M.

Spot Welding of Magnesium Alloys, by W. S. Loose, Aircraft Welding Research Committee, A.W.S. Aircraft Session, Hotel Morrison.

Welding of Armored Tanks, by William Boese, Pullman-Standard Car Mfg. Co., A.W.S. Production Session, Hotel Morrison.

Properties and Uses of Vinyl Resins for Wire and Cable, by G. A. Fowles, B. F. Goodrich Co., W.A., LaSalle Hotel.

11:30 A.M.

A.S.M. Victory Hour, Talk by Capt. G. B. Link, Chief of Armor, Projectile, and Bomb Section, U. S. Navy Bureau of Ordnance.

2:00 P.M.

War Production, Conservation and Post War Planning Meetings, A.S.M., Palmer House.

13. *Salvage*, including battlefield scrap, ferrous and non-ferrous tool steel scrap, and recovery and use of grindings.

14. *Light weight Construction in Post War*, including use of aluminum, magnesium, stainless steel, plastics and wood.

15. *Post War Metallurgical Changes Anticipated*, with discussion of melting, refining, fabrication and treatment of metals.

2:30 P.M.

The Applications of Synthetic Compounds to Wire by Extrusion, by H. K. Intemann, Halowax Products Division of Union Carbide & Carbon Corp., W.A., LaSalle Hotel.

7:00 P.M.

Annual Dinner, A.S.M., Grand Ball Room, Palmer House.

Friday, Oct. 22

9:00 A.M.

The Emissivity of Molten Stainless Steel, by G. N. Goller, Rustless Iron and Steel Corp., A.S.M., Palmer House.

Structural Changes During the Tempering of High Carbon Steel, by D. P.



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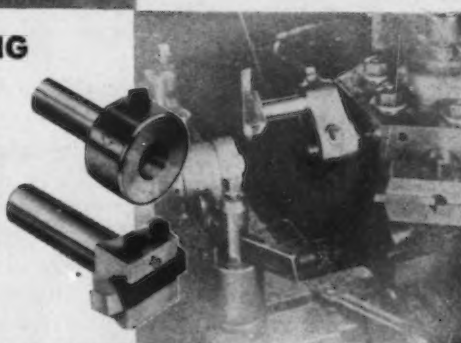
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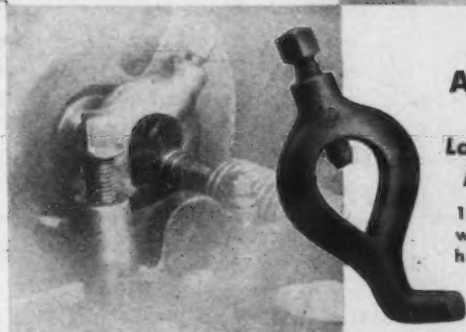
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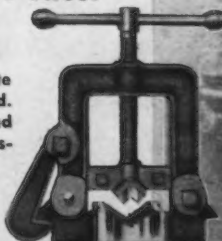
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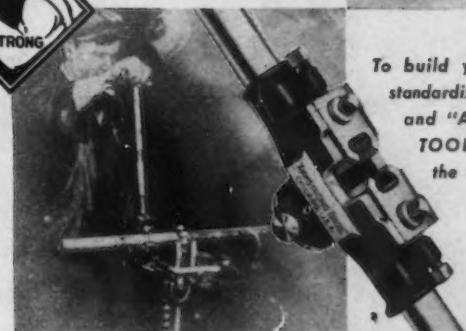
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As long as labor performs an easy day's work instead of a good day's work, high wages which should not cause inflation will contribute to it through excessive costs.

As long as business . . . the kind which we contact when we go to market . . . continues to charge "all the traffic will bear" we are reducing the purchasing power of the dollar and heading for inflation.

Our high standards of living are based upon high wages, low costs and low selling prices. As inflation goes up, our standards of living go down. And usually employment also falls off. Low prices and high wages create jobs.

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Business . . . KEEP PRICES DOWN!

Everybody . . . RENDER GOOD SERVICE!

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Symbols of Technical Societies

Abbreviations used in the Correlated Technical Program of the names of the technical societies participating in the activities of the Metal Show are: A.S.M. — American Society for Metals; A.I.M.E.—American Institute of Mining and Metallurgical Engineers; A.W.S. — American Welding Society; and W.A.—Wire Association.

The meeting places are shown in the program. The times given for the meetings, except for the opening papers of any session, are approximate and depend upon the amount of time devoted to preceding papers presented in the same session. All A.S.M. technical meetings will be held on the fourth floor of the Palmer House.

Antia, S. G. Fletcher, and Morris Cohen, Massachusetts Institute of Technology, A.S.M., Palmer House.
An Emergency Heat Resistant Alloy, O. E. Harder and James T. Gow, Battelle Memorial Institute, A.S.M., Palmer House.

9:30 A.M.

The Effect of Carbon on Tempering of Steel, by S. G. Fletcher and Morris Cohen, Massachusetts Institute of Technology, A.S.M., Palmer House.

9:45 A.M.

Quenching Rate vs. Graphite Formation in Pre-quenched White Cast Iron, by O. W. Simmons, Battelle Memorial Institute, A.S.M., Palmer House.
An Optimum Silicon Range in Plain and 2.0 per cent Chromium Cast Irons Exposed to Elevated Temperatures, by C. O. Burgess and R. W. Bishop, United Carbide and Carbon Research Laboratories, A.S.M., Palmer House.

10:00 A.M.

The Tempering of Nickel and Nickel-Molybdenum Steels, by D. P. Antia and Morris Cohen, Massachusetts Institute of Technology, A.S.M., Palmer House.

10:30 A.M.

Pseudomorphs of Pearlite in Quenched Steel, by Owen W. Ellis, Ontario Research Foundation, A.S.M., Palmer House.
The Effect of Quenching-Bath Temperature on Tempering of High Speed Steel, by Paul Gordon and M. Cohen, Massachusetts Institute of Technology, and R. S. Rose, Vanadium-Alloys Steel Co., A.S.M., Palmer House.
Creep Strength, Stability of Microstructure, and Oxidation Resistance of Chromium-Molybdenum and Chromium-Nickel Steels, by R. F. Miller, W. Benz, and M. J. Day, United States Steel Corp., A.S.M., Palmer House.

11:30 A.M.

A.S.M. Victory Hour, Talk by Brig.-Gen. Herman F. Safford, Chief of Production Service Branch, Office, Chief of Ordnance, U. S. Army.

2:00 P.M.

War Production, Conservation and War Planning Meetings, A.S.M., Palmer House.
16. *Magnesium and Magnesium Alloys with Dow Chemical Co.'s metal picture, "The Working of Magnesium."*
17. *Special Finishes and Metallic Protection. Metal cleaning, plating, electroplating and plastic coating.*

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W. F. and John Barnes Company has both the experience and skill plus the capacity necessary to design and manufacture special machine tools of large or small size for both high and low production.

Our spacious shops have ample facilities for the machining of the long, heavy beds and other component parts for large size machine tools. In addition, adequate space is available for the erecting and testing of all equipment before shipment is made.

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Data on These Machines

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A saving of 96% in machining time is effected with this W. F. and John Barnes Tapping Machine. The eleven spindles of the machine are utilized in two units for operations as follows: One Unit has 4 spindles for 5/16—18 tap; other Unit has 7 spindles for 5/16—24 tap. This machine reduced machining time from 4.44 minutes to .16 minutes.

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General Office and Plant,
WASHINGTON, PA.

Exhibitors at the Metal Congress

(Continued from Page 63)

Industrial Publishing Co., Cleveland. Room 811.
Instrument Specialties Co., Inc., Little Falls, N. Y. Room 713.
International Nickel Co., New York. Room 886.
Iron Age, New York. Room 825.
Industrial Heating, Pittsburgh. Room 970W.
Industrial & Welding, Cleveland. Room 811.
International Tel. & Tel., Newark, N. J. Room 735.
S. C. Johnson & Son, Inc., Racine, Wis. Room 820.
C. Walker Jones Co., Philadelphia. Room 907.
Kelley-Koett Mfg. Co., Covington, Ky. Room 829.
Kennametal, Inc., Latrobe, Pa. Room 948W and 949W.
Mr. Andrew King, Narberth, Pa. Room 780.
Kold-Hold Mfg. Co., Lansing, Mich. Room 865.
Krembs & Co., Chicago. Room 755.
Lepel High Frequency Labs., New York. Room 763.
Lindberg Engineering Co., Chicago. Room 765.
Lukens Steel Co., Coatesville, Pa. Room 732.
Lukenweld, Inc., Coatesville, Pa. Room 732.
Magnaflux Corp., Chicago. Room 745.
Magnetic Analysis Corp., Long Island City, N. Y. Room 756.
Marquette Mfg. Co., Minneapolis. Room 856.
Mercury Mfg. Co., Chicago. Room 817.
Metal Finishing, New York. Room 968W.
Metal Industry Publishing Co., New York. Room 968W.
Metallizing Co. of America, Chicago. Room 903W.
Metal Progress, Cleveland. Room 758.
Metals & Alloys, New York. Room 758.
Mill & Factory, Chicago. Room 880.
Mine Safety Appliances, Pittsburgh. Room 720.
Modern Press, Pittsburgh. Room 967W.
Molybdenum Corp. of America, Pittsburgh. Room 776.
Monarch Steel Co., Indianapolis. Room 958.
E. J. Morrissey Associates, Chicago. Room 830.
Morrison Engineering Co., Cleveland. Room 901.
Motor Products Co. (Deepfreeze Div.), North Chicago, Ill. Room 782.

McGraw-Hill Publishing Co., New York. Room 785.
National Engineering Co., Chicago. Room 816.
National Industrial Pub. Co., Pittsburgh. Room 970W.
National Machine Works, Chicago. Room 911.
Nelson Specialty Welding Equipment Co., San Leandro, Calif. Room 941W.
New Jersey Zinc Sales Co., New York. Room 864.
Nox-Rust Corp., Chicago. Room 845.
North American Philips Co., Dobbs Ferry, N. Y. Room 743.
Ohio Carbon Co., Cleveland. Room 779.
Ohio Crankshaft Co., Cleveland. Room 722.

Society Headquarters

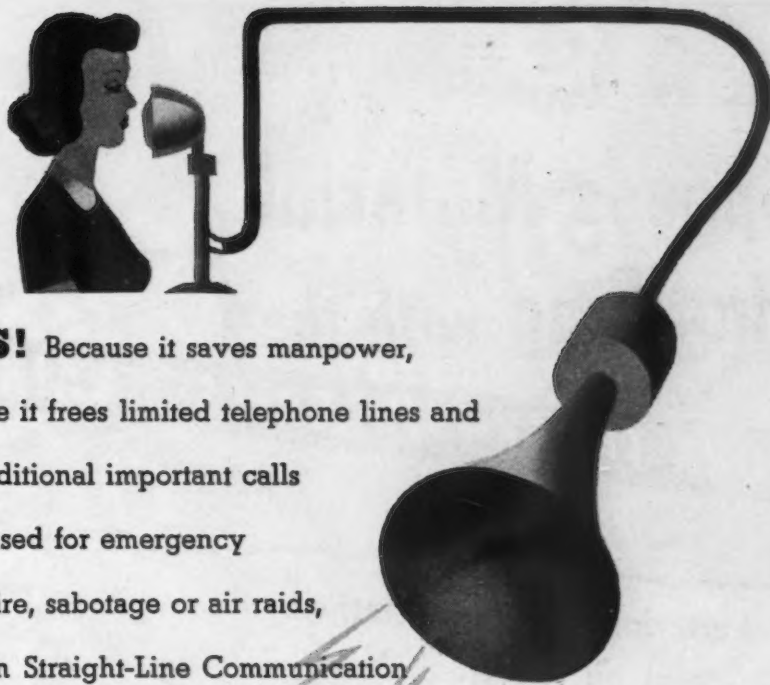
All exhibits at the 25th National Metal Congress and Exposition will be on display on the 7th, 8th, and 9th floors of the Palmer House.

Headquarters for the various participating organizations at the Metal Show will be:

American Society for Metals
Palmer House
American Institute of Mining & Metallurgical Engineers
Hotel Sherman
American Welding Society
Hotel Morrison
Wire Association, La Salle Hotel

O'Neil-Irwin Mfg. Co., Minneapolis. Room 875.
Page Steel & Wire Div., Monessen, Pa. Room 729.
Pangborn Corp., Hagerstown, Md. Room 961W.
Park Chemical Co., Detroit. Room 861.
Phillips Mfg. Co., Chicago. Room 747.
Physicists Research Co., Ann Arbor, Mich. Room 740.
Picker X-Ray Corp., New York. Rooms 715 and 716.
Pines Engineering Co., Aurora, Ill. Room 944.
Pittsburgh Pipe Cleaner Co., Pittsburgh. Room 904.
Precision Scientific Co., Chicago. Room 707.
Product Engineering, New York. Room 785.
Penton Publishing Co., Cleveland. Room 917.
Radium Chemical Co., New York. Room 857.
N. Ransohoff, Inc., Cincinnati. Room 805.
Ransome Machinery Co., Dunellen, N. J. Room 876.
Reynolds Metals Co., Louisville, Ky. Room 907W.

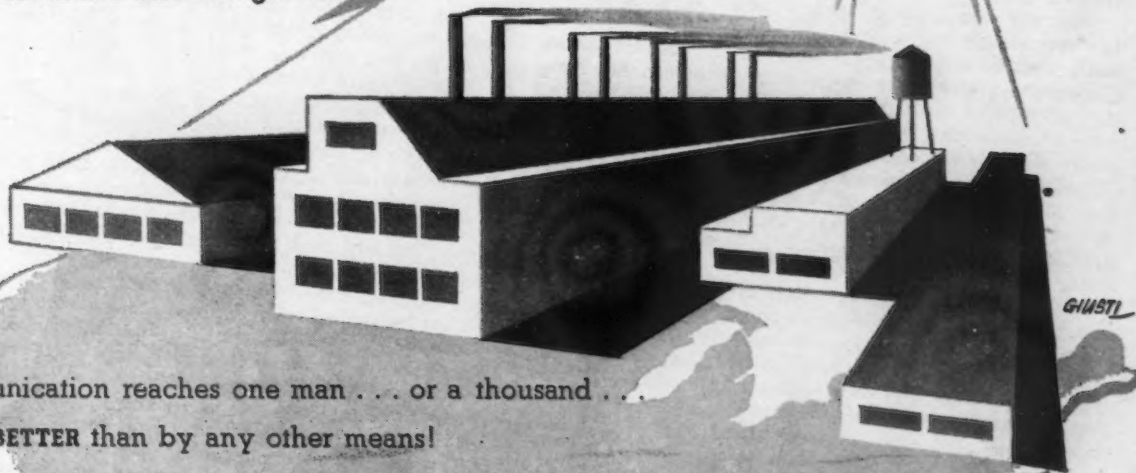
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STRAIGHT-LINE COMMUNICATION SAVES MANPOWER • SPEEDS THE WORK TO VICTORY

THE IRON AGE, October 14, 1943—171.

How the Navy Speeds Material Handling with the

FORK TRUCK—"TRACKLESS TRAIN" SYSTEM

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of Exide Ironclad Topics.

Materials-Handling Methods Used by the U. S. Navy

Sea warfare is a struggle for strategically located bases scattered over the globe. An important ally of the enemy in this struggle is the combination of our lack of shipping space and the vast distances between our bases and continental United States. To reach U. S. naval outposts requires enormous amounts of time.

Time was never more golden than now. In this naval warfare every single minute saved in getting supplies up to the battle areas means that fewer lives will be lost in combat. Consequently, the working time of every person handling Navy supplies must be made as productive as human ingenuity can make it. As in other fields of war activity, the supply of manpower available for materials handling is not inexhaustible. Therefore, in order to make the most of every available man-hour of time, the Bureau of Supplies and Accounts of the Navy Department fully utilizes every kind of modern materials-handling machines and the most efficient methods of operating them.

In an effort to speed the movement of supplies all along the line, the Navy Bureau of Supplies and Accounts prefers contractors to pack materials in unit loads on pallets, wherever practical, so they can be handled in Navy depots with fork trucks. The handling of palletized unit loads with fork trucks eliminates many manual labor operations, which results in a decided saving of time when compared with the "bucket brigade" method of handling now so prevalent—a method older than Egypt's pyramids. Fewer handling operations also reduce the number of chances for the occurrence of damage to materials.

Through a standardized use of palletized materials, it is possible to load or unload railroad cars and highway vehicles by the use of fork trucks more quickly and with fewer men, and fewer accidents. This faster turnover of freight cars and trucks is a very important factor in the full utilization of all available transportation facilities.

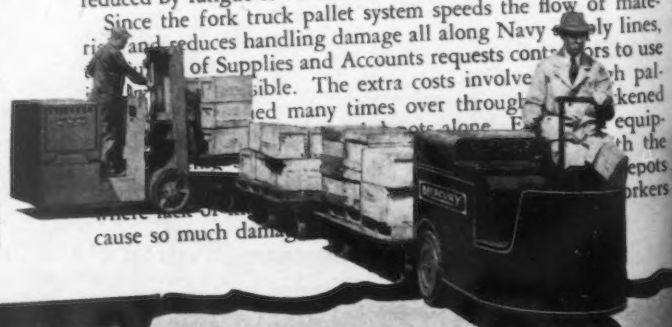
When hauling distances exceed 300 feet, fork trucks are most effectively used to load trailers, which are then made up into trains and hauled by industrial tractors whatever distance may be necessary.

At Navy storage and distributing areas palletized materials permits quicker storage and stacking of larger volumes of materials without additional manpower. Materials properly packed on pallets can be stacked with a fork truck to a height of 16 to 20 feet, wherever headroom permits. In many Navy depots and warehouses this high riering of materials has more than doubled storage capacity. The fork trucks used by the Navy to handle the tremendous, ever-growing volume of materials are essentially elevating (lifting) machines. However, it is practical to use them for hauling if distances do not exceed 300 feet. When hauling distances exceed 300 feet, fork trucks are most effectively used to load trailers, which are then made up into trains and hauled by industrial tractors whatever distance may be necessary. The fork truck, tractor trailer system enables better all-around operation, since neither men, fork trucks nor tractors stand idle during the loading or unloading of trailers.

At the present time an important result obtained from handling palletized unit loads is the increased speed with which barges, lighters and ships can be loaded with fork trucks operating on the barges or in the hold of the ship. The amount of port time thus saved in a year is often enough to allow each ship to make at least one extra trip to some distant naval base.

The fork truck pallet system of materials handling is saving millions of man-hours of critical labor each year. If labor shortages should become more acute, it permits the utilization of less skilled labor, such as older men and women. Furthermore, because fork trucks do the brute work of lifting and carrying, the efficiency of workers is not nearly so noticeably reduced by fatigue toward the end of each shift.

Since the fork truck pallet system speeds the flow of materials and reduces handling damage all along Navy supply lines, the Bureau of Supplies and Accounts requests contractors to use palletized unit loads wherever possible. The extra costs involved are more than made up by the savings in time and the reduction in damage to materials. The extra costs involved are more than made up by the savings in time and the reduction in damage to materials.



MERCURY

THE MERCURY MANUFACTURING CO.

4144 So. Halsted St. • Chicago 9, Ill.

TRACTORS • TRAILERS • LIFT TRUCKS



How fast is a
"FAST"
METAL SAW?



MARVEL No. 4B Light Duty High Speed Saw.

The now universal use of the word "Fast" in describing metal-cutting band saws has led to confusion among saw buyers as to what constitutes fast or high speed metal sawing. Hence this explanation.

You will find that the MARVEL No. 4B cuts at least $2\frac{1}{2}$ times FASTER and at a blade cost of not more than one-third that of band saw machines that are advertised as "fast" and "economical." Before buying any metal cutting band saw, consult our local MARVEL Metal-cutting Engineer. As builders of BOTH hack saws and band saws, we alone can give you an unbiased recommendation as to the best, the "fastest" and the "most economical" saw for your type of work. We will recommend our MARVEL Band Saw ONLY when a reciprocating hack saw will not do your job better. The 24B (illustrated above) is a low-priced machine. MARVEL Heavy Duty All-Bearing Hack Saws are still MUCH FASTER.

On the other hand, the No. 8 MARVEL Band Saw is the most versatile and universal metal-cutting saw built. It will cut off or will make re-entrant cuts in anything from $\frac{1}{8}$ " rod to large structural shapes, bars, castings, or billets up to 18" x 18" in cross section. Because of its wide capacity range and unique design; its large T-slotted table with quickly removable vise jaws; its horizontal 18" carriage movement that feeds the entire blade-carrying column straight forward through the work at any angle from 45 degrees left of vertical. It is ideally suited to tool room, stock room, maintenance, fabricating, and production work, when the wide range of work encountered requires the exclusive features of this universal machine that are not available in any hack saw or in any other band saw. Only the MARVEL No. 8 has the capacity range for cutting-off EVERYTHING in combination with availability for making re-entrant cuts, notching, coping, miter cutting and roughing-out work to size and shape.

DON'T CONFUSE THE MARVEL No. 8 WITH ANY OTHER BAND SAWS. THERE IS NO COMPARISON. ONLY THE MARVEL No. 8 IS UNIVERSAL!

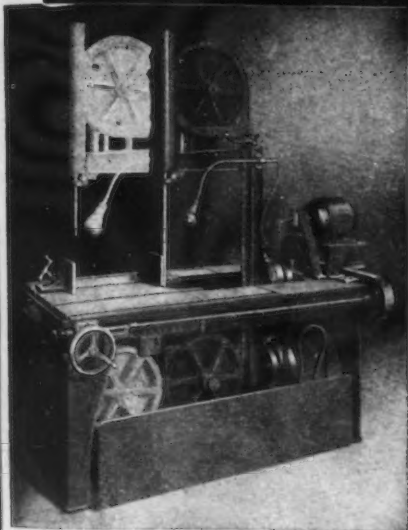
FOR FASTEST AND MOST ECONOMICAL WORK IN CUTTING OFF BAR STOCK USE A HACK SAW. FOR UNIVERSAL WORK IN AN EXTREME RANGE OF WORK SIZES USE A MARVEL No. 8 METAL BAND SAW.

Whenever the relative urgency for War production requires it, reasonably prompt deliveries can be made.

MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"
5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.
Eastern Sales: 225 Lafayette St., New York



Double Exposure—Showing limits of feed travel and position of main column for square cutting.

Front View—Showing column set at angle of 45° to right of vertical for miter cutting.



Announcing...

TWO SUPPLEMENTARY VOLUMES OF BEILSTEIN

Ready for distribution Oct. 15—two additional volumes of Beilstein's *Handbuch der Organischen Chemie*, 4 Aufl. These volumes, 2 and 3/4 of the second supplement, cover the literature for 1920-1929 and are supplementary to volumes 2-4 of the main series and volumes 2-4 of the first supplement. They conclude the treatment of acyclic compounds begun in Vol. 1 of the second supplement (1941).

Band 2 (1942), xxx, 760 p.
Price \$12.50

Band 3/4 (1942), xxxvii, 1136 p.
Price \$12.50

FIFTY-THREE OTHER GERMAN TECHNICAL TITLES

In addition to the complete Beilstein, we publish (under authority of the U. S. Alien Property Custodian) 53 war-important German works in the fields of chemistry, biology, metallurgy, physics, mathematics, etc. Included are the following:

BAUER, OSWALD, and KROEHNKE, and MASING: *Die Korrosion metallischer Werkstoffe*. 1936-1940. 3 vols.

Vol. 1: *Die Korrosion des Eisens und seiner Legierungen*, xxii, 560 p. Price \$13.65

Vol. 2: *Die Korrosion von Nichtisenmetallen und deren Legierungen*, xxx, 901 p. Price \$22.50

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Three Volumes (Original price \$63.50) Price \$49.75

BURKHARDT, ARTHUR: *Technologie der Zinklegierungen*. 2. erweit. Aufl. 1937; xii, 256 p. (Original price, \$15.12) Price \$10.65

FLUEGGE, WILHELM: *Statik und Dynamik der Schalen*, 1934; vii, 240 p. (Original price, \$9.00) Price \$5.75

KUEHNEL, REINHOLD: *Werkstoffe für Gleitlager*. 1939; ix, 427 p. (Original price, \$15.92) Price \$8.65

PETERS, JEAN: *Eight-Figure Table of the Trigonometrical Functions for Every Second of Arc*. 1939. (English Preface & Introduction) xi, 901 p. (Original price, \$24.00) Price \$20.00

Circulars describing the 53 titles mailed on request. Prices are f.o.b. Ann Arbor, Mich. if cash accompanies order, 2% discount and f.o.b. destination.

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Westinghouse Electric & Mfg. Co., East Pittsburgh. Rooms 750, 751, and 752.
Wheelco Instruments Co., Chicago. Room 902.
Wilson Mechanical Instrument Co., New York. Room 746.

UAW Advocates New Manpower Plan

Buffalo

• • • The CIO-United Auto Workers, claiming to be the largest union in the world, adopted a resolution at its annual convention here demanding a complete overhauling of the nation's war manpower setup from Paul V. McNutt down.

The convention advocated immediate inauguration of a comprehensive national war manpower program embracing: (1) Centralization and coordination of the manpower agency with production and procurement; (2) Full mobilization and utilization of all workers; (3) Facilitation of manpower allocation through establishment of fair labor standards; (4) Establishment of area and regional labor pools; (5) Efficient utilization of farm labor.

The manpower resolution also demanded there be "no ordered referral to lower paying jobs" and called for "complete freedom of workers to move

to higher-skilled jobs." This clause of the resolution contradicts the most bitterly controverted provision of the Buffalo-Niagara referral plans, which compels a worker to accept less money than he received in his former position if his new assignment is vital to the prosecution of the work.

Mesta Machine Sued By USWA on Pay Charge Pittsburgh

• • • The United Steelworkers of America early this week filed suit against the Mesta Machine Co. in Federal Court here, for an estimated \$500,000 in alleged under-payments to its union members under the Wage and Hours Law, plus an additional equal amount as liquidated damages.

The suit demands costs, disbursements and counsel fees to be paid by the company.

Sure, it's easy!



Is it easy to make fighting steels... easy to work long hours without sacrificing quality... easy to break tonnage records when every heat must be rigidly true to specifications? Sure, it's easy! But, it takes a life-time of living, working and thinking Steel to get ready to do the job. It takes a background of experience, like the 117 years that goes into the making of "A.W." Quality Steels. If you are engaged in war production and have an Alloy Steel problem, we will be pleased to serve you.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives: Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, St. Paul, New Orleans, Pittsburgh, Roanoke, Sanford, N.C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal.

DO YOU USE GRINDERS FOR SURFACING?

YES, WITH SILVER STREAK BELTS!



Grinders With
SILVER STREAK

Metal Working
Cloth Belts Much Faster Than Millers,
Shapers — Many Plants Find

SILVER STREAK — that's the abrasive belt that lets you switch from millers or shapers to grinders, in order to speed up production on surfacing jobs. Equipped with fine grit **SILVER STREAK** metal working cloth belts, you can turn out work up to 50% faster, many plants find. You can also maintain tolerances as fine as .0005 with ease.

You can do this because **SILVER STREAK** Belts are insulated to withstand grinding heats up to 1700° — they keep cutting uniformly and accurately long after ordinary belts have quit. Abrasive Products, Inc., 535 Pearl Street, South Braintree, Mass.

ABRASIVE

SOUTH BRAINTREE

JEWELOX • JEWEL EMERY • JEWEL GARNET



INC.

PRODUCTS

MASSACHUSETTS

JEWELITE • JEWEL FLINT • NEW PROCESS

DPC Announces Construction Contracts

Washington

• • • Defense Plant Corp., RFC subsidiary, has authorized the following contracts:

The National Refining Co., Coffeyville, Kan., to provide additional facilities at a plant in Kansas at a cost in excess of \$1,660,000, making a total commitment of more than \$4,800,000.

Rohr Aircraft Corp., Chula Vista, Cal., to provide additional facilities at a plant in California at a cost in excess of \$320,000, making a total commitment of more than \$3,240,000.

Okonite Co., Inc., Passaic, N. J., to provide additional plant facilities in New Jersey at a cost in excess of \$150,000, making a total commitment of more than \$445,000.

Chatham Engineering Co., Inc., Chatham, N. J., to provide plant facilities in New Jersey at a cost in excess of \$40,000.

Republic Steel Corp., Cleveland, to provide additional facilities at a plant in Connecticut at a cost in excess of \$240,000, making a total commitment of more than \$1,700,000.

Sylvania Electric Products, Inc., Emporium, Pa., to provide additional plant facilities in Massachusetts at a cost in excess of \$370,000, making a total commitment of more than \$980,000.

Rohm & Haas Co., Philadelphia, to provide additional facilities at a plant in Pennsylvania at a cost in excess of \$330,000, making a total commitment of more than \$400,000.

The Cincinnati Gear Co., Cincinnati, to provide additional equipment at a plant in Ohio at a cost in excess of \$20,000, making a total commitment of more than \$150,000.

Worth Engineering Co., Inc., New York, to provide equipment at a plant in New York at a cost in excess of \$35,000.

Consolidated Mines, Inc., Seattle, Wash., to provide facilities at a plant in Washington at a cost in excess of \$30,000.

International Minerals & Chemical Corp., Chicago, to provide plant facilities in Ohio at a cost in excess of \$1,200,000.

Lederle Laboratories, Inc., New York, to provide plant facilities in New York at a cost in excess of \$470,000.

Firestone Tire & Rubber Co., Akron, Ohio, to provide facilities at a plant in Ohio at a cost in excess of \$370,000.

Ben Venue Laboratories, Inc., Pittsburgh, to provide plant facilities in Ohio at a cost in excess of \$340,000.

General Insulated Wire Works, Inc., Providence, R. I., to provide additional equipment at a plant in Rhode Island, at a cost in excess of \$25,000, making a total commitment of more than \$65,000.

The Babcock & Wilcox Co., New York, to provide additional facilities at a plant in Ohio at a cost in excess of \$100,000, making a total commitment of more than \$2,840,000.

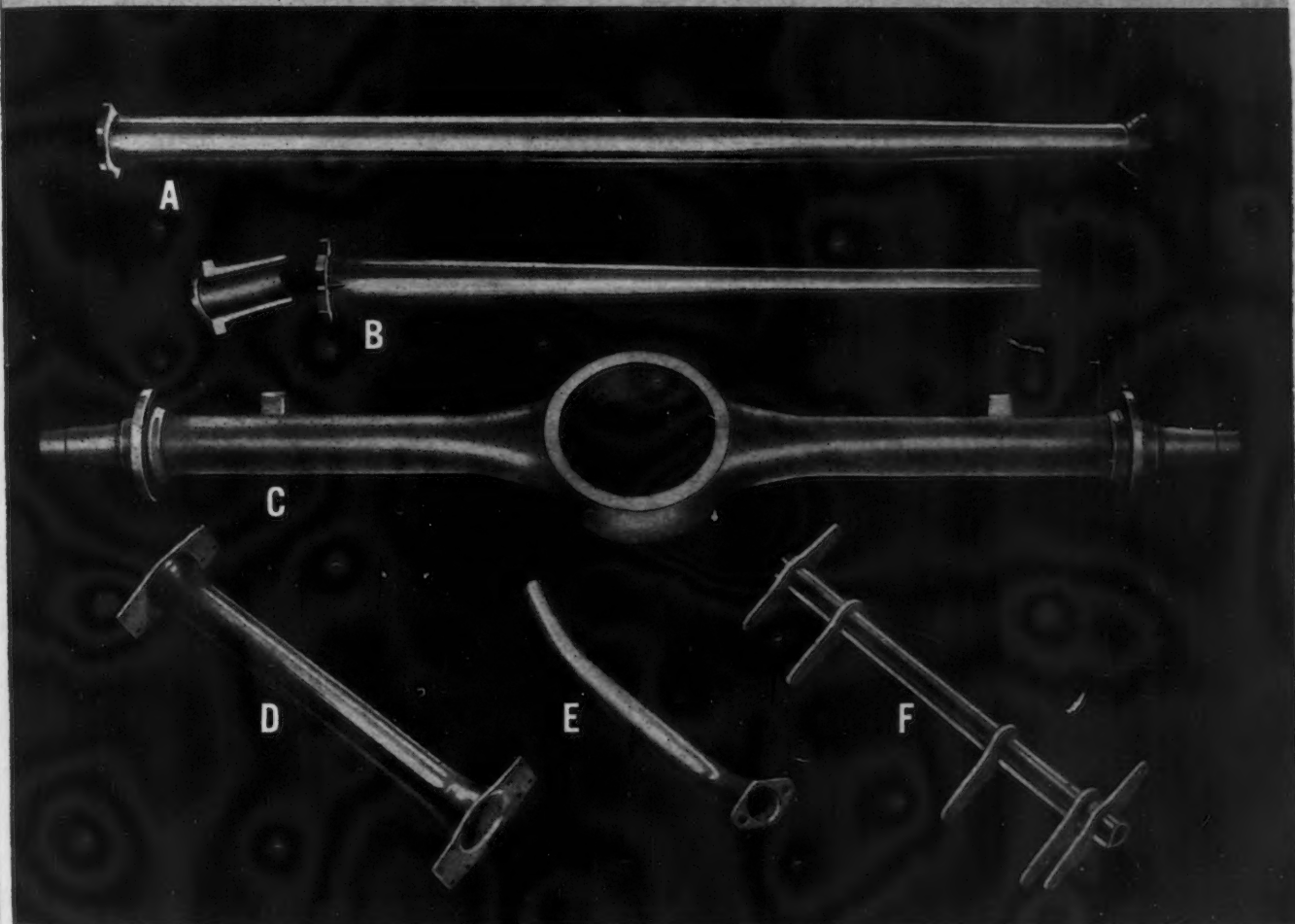
National Union Radio Corp., Newark, N. J., to provide additional facilities at plants in New Jersey and Pennsylvania at a cost in excess of \$210,000, making a total commitment of more than \$2,220,000.

Taylor Refining Co., Taylor, Tex., to provide additional facilities at a plant in Texas at a cost in excess of \$390,000, making a total commitment of more than \$1,400,000.

Lighting Creek Coal Co., Pittsburg, Kan., to provide plant facilities in Kansas at a cost in excess of \$80,000.

AMERICAN METAL PRODUCTS COMPANY

Manufacturers of Welded Steel Tube, Tubular Parts and Assemblies for the Transportation Industry

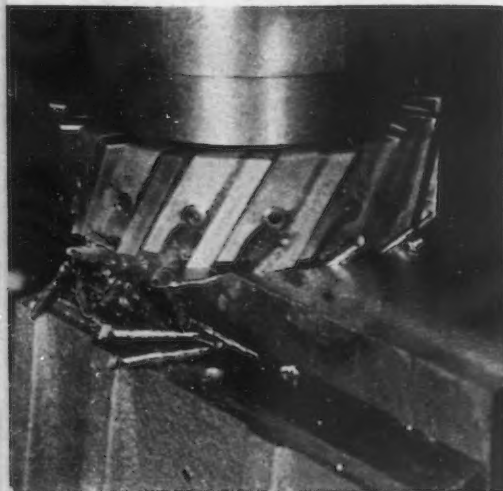


DESCRIPTION OF PARTS: A—One Piece Torque Tube. B—Torque Tube. C—Rear Axle Housing. D—Frame Rear Cross Tube. E—Spare Wheel Carrier Arm. F—Brake Cross Shaft.

We are serving transportation manufacturers in war, as in peace, with quantity produced welded-steel tubular parts made by the hot and cold process . . . upsetting, forming, swaging, forging, welding, heat treating and machining.

AMERICAN METAL PRODUCTS COMPANY, 5959 LINSDALE AVE., DETROIT, MICHIGAN

NEW FACE-MILLING PERFORMANCE WITH



The Ingersoll Shear Clear face mill is a patented design based on the discovery of entirely new cutting angles. The blades are set in the cutter body at steep negative rake and positive shear angles . . . The blade strikes the work-piece at a point ahead of center on its beveled cutting edge and gradually increases the chip width in a shearing action. (See upper sketch). It has been proven that a blade thus eased into the work causes far less impact shock and suffers less itself than the conventional blade, whose cutting edge

strikes the work-piece squarely. (See lower sketch) . . . Here the blades are set at relatively slight rake and shear angles.

The Shear Clear chip coils evenly and continuously outward and falls away from the cutter at the end of the cutting arc . . . This is demonstrated in the upper row of photographs . . . Chips of the conventional cutters break up and fall under the face of the cutter, there to be ground over the milled surface. (See lower photographs).

THE INGERSOLL MILLING

SHEAR CLEAR

Ingersoll Shear Clear face mills are especially adapted to work in tough steel and the soft, stringy non-ferrous metals . . . They will solve many of the problems you are experiencing in milling these materials.

Some of these cutters are being used in one-cut operations, producing surfaces smooth enough to eliminate the finishing cut.

Their free cutting, shearing action permits you to use much higher feed rates . . . Many users have tripled their former feed rates. Some are cutting at four to six times faster feeds than before under identical machining conditions.

Cutting steel at 10" a minute feed, the Shear Clear cutter shown on foregoing page removed double the depth of stock cut by the conventional cutter feeding at only 4" a minute — and produced a smoother finish.



If you are milling flat surfaces it will pay you to investigate the benefits of applying Ingersoll Shear Clear Cutters to your work. Your inquiry should state diameter and hand of cutter, type of material and amount of stock being cut.



MEDIUM DUTY SERIES for milling cast iron or steel where stock does not exceed 5/16".



HEAVY DUTY SERIES for milling cast iron or steel where stock does not exceed 1/2".



EXTRA HEAVY DUTY SERIES for milling cast iron or steel where stock does not exceed 1".

INGERSOLL MACHINE CO., ROCKFORD, ILL.



E F Gas Fired Continuous Chain Belt Conveyor Type Furnaces for

Scale-Free Hardening Small Parts

Bolts, Springs, Gears, Bearings and Other Products

--300 to 1700 lbs. per Hour

The above E F gas fired furnace installation is one of several similar installations we have made for scale-free hardening bolts. E F Continuous Chain Belt Conveyor Type Furnaces are handling all kinds of products ranging in sizes from small springs and machine gun cartridge clips up to large crawler links for tanks and tractors. Hundreds of these furnaces are in operation.

The material is loaded directly onto rugged heat resisting cast link belt conveyors. Without further attention, it is carried through the furnace, uniformly heated to the proper temperature and automatically discharged through a sealed chute to the quenching medium or directly from the furnace as desired. The chain belt conveyor returns within the furnace without cooling—no pans or trays are used in the furnace—100% net material.

Tank armor castings, shell forgings, cartridge cases, bomb and gun parts, aircraft and aircraft engine parts, and many other allied products are being uniformly treated in outstanding production furnaces built by the Electric Furnace Company, Salem, Ohio. We specialize in designing and building production furnaces.

Send for circulars showing these and other types of E F Production Furnaces

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

These furnaces are built for oil, gas or electric heat in five standard sizes with capacities ranging from 300 to 1700 lbs. per hour. Larger or smaller sizes can also be furnished. They are also designed for using special protective atmospheres for scale-free heat treating and hardening without decarburization.

The hundreds of installations in operation, handling all kinds of material, have proven the continuous type furnaces the most satisfactory and dependable general purpose heat treating machines built for the uniform, economical, continuous production heat treatment of miscellaneous small and medium sized parts and products.

The Chain Belt Conveyor Furnace is only one of the numerous types we build for various heat treating purposes.

Trade Notes

United States Steel Products Co., a U. S. Steel subsidiary, has contracted to purchase the manufacturing assets of the Petroleum Iron Works Co., subsidiary of American Republics Corp. United States Steel Products Co., known as Boyle Mfg. Co. until Sept. 23, when its name was changed, is the Pacific Coast lightweight steel fabricating subsidiary of United States Steel.

Heller Bros. Co., manufacturers of files, rasps, tools and steel, Newark, N. J., has acquired the goodwill, trade name and patents of the Cleveland File Co., Cleveland, Ohio. John E. Nicklis, formerly associated in an executive capacity with the Cleveland organization, is now with Heller.

Effective Sept. 1, Ault & Wiborg Corp., a subsidiary of Interchemical Corp., became the Ault & Wiborg division of Interchemical Corp.

Wean Engineering Co., Inc., Warren, Ohio, announced that its subsidiary, the Broden Construction Co., Cleveland, has entered into an exclusive arrangement with John A. Holmquist, Aliquippa, Pa., to manufacture and sell the Holmquist line of machinery for production of barbed-wire, wire fencing, wire netting, wire mesh, bale ties, spools, and reels. This will augment the present Broden line of wire drawing, galvanizing, tinning, and other processing lines.

Story of Bazooka Production Revealed by General Electric

• • • When General Electric received a handmade model of the now famous Bazooka rocket gun from Army Ordnance, workers who formerly made electrical household appliances switched over to production of the new gun. Within 30 days several thousand Bazookas had been delivered to the armed forces.

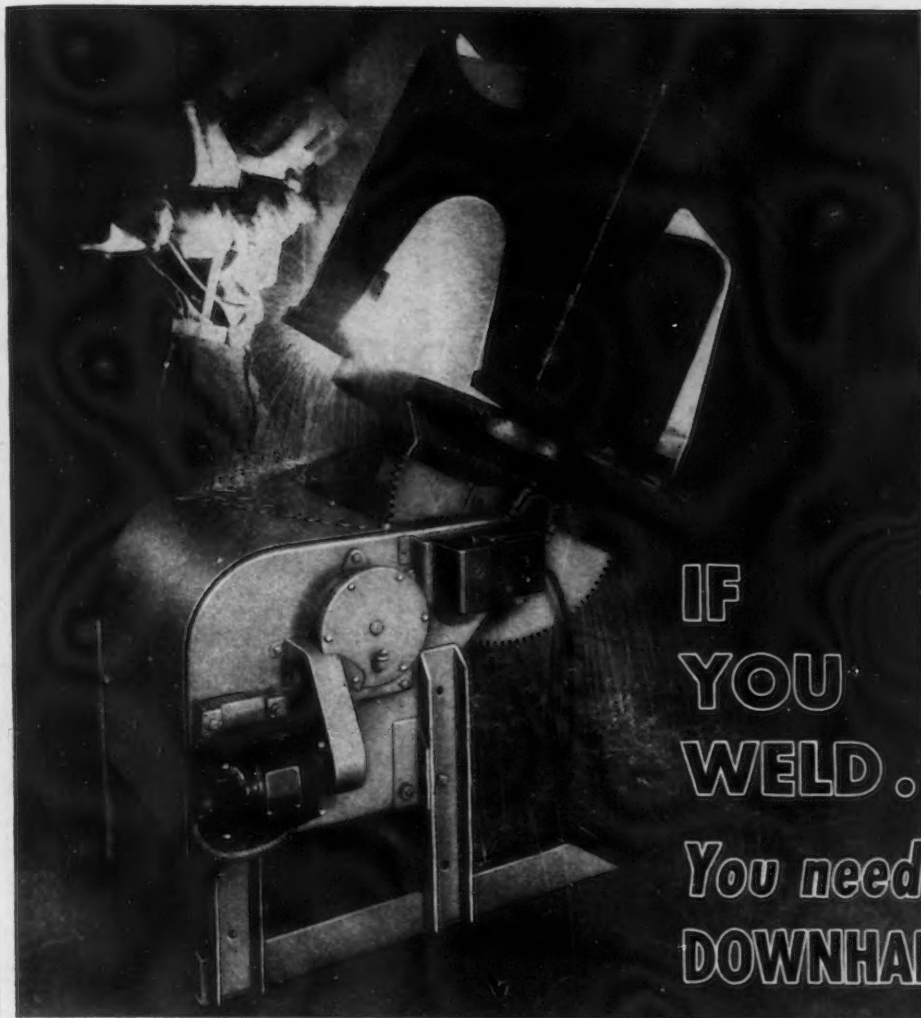
Transportation of materials was a major problem in carrying out this program. A supply of steel was flown in from Pittsburgh, and additional steel was trucked across the country from steel mills to the Bazooka factory by crews of drivers who worked in relays around the clock.

This occurred back in 1942. Since then Bazookas have been produced continuously by the factory in ever-increasing quantities since completion of the initial order.

Cash Awards Approved For Employee's Suggestions

Washington

• • • Employee suggestions designed to increase production may be rewarded by cash awards or bonuses without approval of the National War Labor Board if the awards are actual compensation for the suggestions and are not hidden wage increases, the WLB General Counsel has ruled.



Low-cost 500-lb. capacity unit,
available either hand-operated
or motor-operated

IF YOU WELD... You need the DOWNHAND POSITION

Here's why you need it...

Most important, it will greatly increase your welding production. In many cases, it means that you can do a job in one pass that would require two, three or more passes when the weldment cannot be placed in the ideal downhand position.

It means smoother, stronger, welds... time saved in both handling and welding... rod savings... and the good will of your welders.

Here's how you can get it...

Install Ransome Welding Positioners. With this equipment, your welders can shift their work at will, without crane service, without loss of time, without wasting precious physical energy. Every seam is just where it should be... in position for downhand welding.

There's a unit to fit every welding job. Write for full information.

Units on display at National Wartime Metal Congress... October 18 to 22...
Room 876, Palmer House, Chicago



Capacities 500-lb. to 40,000-lb., hand-operated and motor-operated... Head-stocks and Tail-stocks... Turning Rolls

Industrial Division • RANSOME MACHINERY COMPANY • Dunellen, New Jersey

Subsidiary of WORthington PUMP AND MACHINERY CORPORATION

Ransome WELDING POSITIONERS

PERSONALS

• **John J. Ryan**, Republic Aviation Corp. counsel, has been elected a vice-president of the firm. Mr. Ryan came to Republic Aviation in 1941, after being associated with Bleakley, Platt & Walker, of Manhattan and White Plains.

• **Horace F. McIntyre** has been made sales and service representative to cover the Philadelphia territory of the Pennsylvania Salt Mfg. Co., Philadelphia.

• **Charles Buckingham** has retired as shipping clerk for the Seymour Mfg. Co., Seymour, Conn. Mr. Buckingham joined the company shortly after its organization and had been there 63 years.

• **Carl C. Joys, Jr.**, has joined the General American Transportation Corp., Chicago. Mr. Joys was previously associated with the A. O. Smith Corp.

• **Fred L. Black**, one-time advertising manager of Ford Motor Co., has joined Nash-Kelvinator Corp. as assistant to vice-president A. M. Wibel.

• **C. W. Van Ranst**, who resigned last month from the engineering department of Ford Motor Co., has joined F. L. Jacobs Co. to design and develop engines.

• **Robert M. Reid** has been appointed traffic manager of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., succeeding the late John H. Schroeder. Mr. Reid joined the company in 1917 as a rate clerk in the traffic department.

• **Morgan D. Lalor** has been made assistant general sales manager for Reynolds Metals Co., Richmond, Va. He joined the company in 1940 as head of the sales statistical department.

• **Karl M. Greiner** has been named parts and service manager for the Packard Motor Car Co., Detroit. He succeeds J. F. Page, who has resigned after 24 years with the company.

Correction: F. B. DeLong, erroneously referred to as vice-president and general manager of sales of Geneva Steel Co. in the Sept. 9 issue, is vice-president and general manager of sales at Columbia Steel Co., Pittsburg, Cal.



PEER D. NIELSEN, general superintendent, Geneva Steel Co., Geneva, Utah, U. S. Steel Corp. subsidiary.



EDWARD K. MYERS, assistant treasurer of Lukens Steel Co., Coatesville, Pa.

• **Peer D. Nielsen** has been appointed general superintendent, **Clifford G. Strote**, purchasing agent, and **Howard M. Dashbach**, traffic manager, of Geneva Steel Co., Geneva, Utah, a U. S. Steel Corp. subsidiary. Mr. Nielsen became associated with the corporation subsidiaries in 1924, and until recently was chief engineer of Lorain, Ohio, Works, National Tube Co. Mr. Strote was formerly assistant purchasing agent in the Defense Plant Division, Columbia Steel Co. Mr. Dashbach was president and treasurer of the Ohio Barge Line prior to his appointment.

• **George E. Smith**, vice-president of the Midvale Co., Philadelphia, was elected to the board of directors to succeed Conrad N. Lauer who died recently.

• **Irving B. Babcock** has been elected a vice-president of General Motors Corp. and general manager of the newly formed GMC Truck & Coach Division of General Motors, which division is taking over the business formerly conducted by the Yellow Truck & Coach Mfg. Co. Mr. Babcock was formerly president and general manager of Yellow Truck & Coach Mfg. Co.

• **Van S. Wielosinski** has been appointed plant metallurgist at Willys-Overland Motors, Toledo, Ohio. Mr. Wielosinski comes to Willys-Overland from the Carnegie-Illinois Steel Corp., Chicago, where he was engaged in metallurgical research and development.

• **Edward K. Myers**, who has been credit manager for Lukens Steel Co. and subsidiaries, Coatesville, Pa., was recently elected assistant treasurer of Lukens Steel Co. Mr. Myers joined Lukens in 1930, serving in the comptroller's office, cost department and treasury department, until his appointment as credit manager in 1940.

• **Thomas J. Anderson** has been appointed director of purchases by Acme Steel Co., Chicago. He has been associated with Acme for over 25 years, most recently as purchasing agent. He is succeeded as purchasing agent by **Frank W. Shymkus**, who has been with the company since 1925.

• **Charles F. Dickinson** has been appointed assistant manager, metallurgical division, Carnegie-Illinois Steel Corp., Chicago district, succeeding **L. J. Rohl**, recently named manager of the department. Mr. Dickinson joined Carnegie-Illinois in 1937 as assistant to the general superintendent at the Gary sheet and tin mill.

• **Albert R. Zelt** was elected a ranking vice-president of the Oil Well Supply Co., U. S. Steel subsidiary. He was formerly vice-president in charge of manufacturing for the company.

• **R. S. Arnold** has been appointed as assistant to the sales manager of the American Welding & Mfg Co., Warren, Ohio. He was formerly manager of the Ideal Foundry Division of Republic Steel Corp., Newton Falls, Ohio.



HERMAN KLUENDER, Director and vice-president in charge of manufacturing for Detroit Gray Iron Foundry Co., and its subsidiary, Detroit Alloy Steel Co.



T. W. PENNINGTON, vice-president in charge of sales, Jessop Steel Co., Washington, Pa.

• **Herman Kluender**, former vice-president of Detroit Alloy Steel Co., a subsidiary of Detroit Gray Iron Foundry Co., was made director of Detroit Gray Iron, and vice-president in charge of manufacturing, for both firms. **James L. Blean**, formerly with Gerity-Adrian Mfg. Co., was elected secretary and treasurer of Detroit Gray Iron. **John Smyly**, formerly with General Motors, was named director of sales for Detroit Gray Iron and Detroit Alloy Steel.

• **Albert J. Bradley** has been appointed general sales manager of Prack Laboratories, Inc., New York. He was formerly with Armour & Co.

• **Richard Donham**, former professor of business administration at Northwestern University, has been appointed director of commercial research and postwar planning at Gisholt Machine Co., Madison, Wis.

• **Captain Bernard Margulis**, formerly chief of the priorities section

and assistant chief of the materials and equipment section of the New York Chemical Warfare Procurement District of the War Department, has been made redistribution and salvage officer of the same district. He will be in charge of scrap material.

• **John Hauerwaas** is the newly appointed president of United States Steel Products Co., U. S. Steel Corp. subsidiary. The new company was formerly the Boyle Mfg. Co.

Other appointments were those of **T. McGahan** as vice-president and general manager of sales, and **A. E. Klieves** as vice-president in charge of operations of the Boyle Mfg. Division. At the same time, **J. A. Connelly** was appointed vice-president and general manager, and **William I. Hanrahan**, vice-president of the Petroleum Iron Works Division, U. S. Steel subsidiary.

• **Lawrence B. Jackson** has been recently appointed director of engineering for the Diesel Division of American Locomotive Co.

• **T. W. Pennington** has been appointed vice-president in charge of sales by the Jessop Steel Co., Washington, Pa., with whom he has been associated since 1933. Previously, he was with the Crucible Steel Co.

• **Owen L. Holland** has been appointed district manager, welding division, for the Chicago territory of Metal & Thermit Corp., New York. Mr. Holland was formerly chief of the welding, electro-plating and equipment branch of WPB.

OBITUARY...

• **Charles M. Hewett**, sales engineer for the Grinnell Co., Inc., Boston, died suddenly Sept. 20 at Scituate, Mass. He was 52 years of age.

• **Richard P. Howell**, treasurer of the J. I. Case Co., Racine, Wis., for the past 14 years, died Sept. 16 at Rochester, Minn. He had been with the firm since 1898 when he started in the collection department.

• **Harold G. Hobbs**, metal process engineer for Quaker Chemical Products Corp., Conshohocken, Pa., died recently. He was district manager in the Cincinnati territory for the company.

• **W. O. Ingle**, vice-president and treasurer of Consolidated Machine

Tool Corp., died recently. He was 68 years of age.

• **Clayton L. Roloson**, production manager of Mercury Aircraft Inc., Hammondsport, N. Y., was a victim of the Lackawanna train disaster at Wayland, New York. Mr. Roloson had been connected with the aircraft industry since 1914 when he first went to work for the Curtiss Aeroplane & Motor Co., in Hammondsport, New York. He held a number of executive positions in the industry including that of vice-president and factory manager of Keystone Aircraft, and president of the Ludington Boat Corp.

• **Charles P. Kratzman**, manager of the Buffalo branch of W. A. Case & Son, died September 28.

• **F. Joseph Lamb**, president of the Lamb Mfg. Co., Detroit, died recently.

Mr. Lamb was one of the veterans of the tool and die business in Detroit.

• **Robert E. Mayo**, sales engineer and middle west representative of the National Acme Machine Co., Cleveland, died Sept. 28. He had been with the Cleveland firm for 34 years.

• **Charles Carle**, vice-president of Gunn, Carle & Co., San Francisco, was killed in a traffic accident on September 14. He was 60 years old.

• **Werner Troger**, former export manager for the Harnischfeger Corp., Milwaukee, died Sept. 27 after a short illness.

• **Frank Nickerson**, manager of sales in the San Francisco district for the Bethlehem Steel Co., died recently. After service in the last war he was with the Midvale Steel & Ordnance Co. in San Francisco and joined Bethlehem in 1922.

MACHINE TOOLS

... News and Market Activities

Berna Discusses Terminations

(Continued from page 125)

As it now stands, such a claim would pass from a customer to his customer and so on to the prime contractor, and would get extremely complicated. Another solution suggested might be to authorize each of the armed services to send an officer to arrange the cancellation of all PD-3-A orders from that service and its contractors in a certain plant at one visit, thus relieving customers and contracting officers of much detail.

Emphasis was placed by Mr. Berna on the importance of legislation providing an immediate cash payment and for the prompt disposal of parts. He suggested that on an invoice for cancellation charges, items that will be scrapped and their value as scrap, listed as a separate item, as well as those that can be accepted and put into stock in their present form by the machine tool builder would be very helpful. While in general the machine tool industry is fortunate in that a declining demand will enable it to

reduce commitments and inventories so that the final deluge of cancellations will find the builder in a relatively favorable position, Mr. Berna said that the job of obtaining prompt and fair settlement on termination will be serious for some time to come.

The machine tool industry will use only about one-fourth its capacity in meeting the requirements of the war effort during 1944, it was predicted by Walter W. Tangeman, president of the National Machine Tool Builders Association and vice president of the Cincinnati Milling Machine Co.

Mr. Tangeman stated that "we shall be expected to reserve capacity in our plants for manufacturing all the machine tools that will be required in the war effort and at the same time use the balance of our capacity for other types of work. Our foremost responsibility is that of continuing to use all of our facilities and the special skills of our employees on behalf of the war effort."

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Norton Officer Outlines Post-War Plans

New York

... In any company's post-war planning, the determination of the post-war level of production and employment should be the starting point and this necessarily involves making a forecast of customer demand in the immediate post-war period, according to Wallace T. Montague, vice-president of the Norton Co., Worcester, speaking before the annual meeting of the Controllers Institute of America last month in New York.

In order to do this, the Norton Co. reviewed the facts already accumulated pertaining to its operations, starting before the first World War, and then set out to uncover what information it could find on the post-war status predicted for some of the types of business which make up the more important segments of its market... the automobile industry, steel production, etc. National income and the relation of Norton business to past and probable future national income figures were plotted, as well as the sales indicated by the past rela-

tionships between the Federal Reserve Board index of industrial production and domestic sales from 1929 to date.

As a result of these studies, Norton developed a definite forecast of demand for the immediate post-war years. It is susceptible of adjustment up or down depending on the behavior of the primary factors used in the calculations, Mr. Montague said. It should be a fairly intelligent preliminary guide. A check is about to be made by a series of field studies.

Having made the forecast of business volume to be expected after the war, it is not difficult to apply the forecast by estimating such matters as the size of the working force, hours of work required, floor space to be needed, inventories of raw materials and finished goods required and working capital necessary to finance the operations at the predicted level.

The Norton Co. has a general steering committee whose first job was to survey the overall aspects of the company's problem and to outline a general method of approach. The next

step was to form a post-war planning council, headed by the chairman of the board and with all departments represented through the chairmen of departmental committees which will deal with research and product development, production and production planning, domestic and export sales, personnel and employment and financing and accounting.

Small Tool Inventories Declared Not Excessive Cleveland

... The apparent concern of some of the small tool manufacturers that excessive inventories are being accumulated by manufacturing plants has grown to the point of coming to the attention of the WPB. Some sort of plan for the redistribution of such expendable materials is under consideration.

However, the still tight situation on deliveries of collets, cutting tools, and various and sundry standard accessories tends to belie the belief that there is a general trend toward the accumulation of excess inventories of small tools. For example, the best deliveries of collets still run about 12 weeks.

A limited investigation of manufacturers of small tools revealed that the majority of manufacturers felt that any huge surpluses of small tools are pretty spotty. They do feel that the cancellations of government contracts have left some manufacturers with tool inventories, but even these companies are attempting to work out such supplies.

Unionists Loudly Demand Conversions in Cincinnati

... With the production of machine tool plants in the area beginning to taper, representatives of the CIO who have organized some of the plants in this area, are becoming louder in their demands for conversion. Appeals are being made by these groups through WPB and various other war agencies, in an effort to get an immediate conversion to withstand current reported lowering of production.



WANTED: A device for measuring sacrifices!

What is a sacrifice?

There are even some who call it a sacrifice to buy bonds which pay back four dollars for every three invested. Others complain loudly when their pleasure driving is cut down.

Still others grumble when they are asked to save waste fats, tin cans, and paper.

What would these people say if they had to face the hardships, privations and sufferings endured by countless thousands of our boys on the far flung battle fronts of this global war? Being true Americans, they would probably have their eyes opened and would buckle down to the job.

We are all asked to make sacrifices these days. But the ones on the home front are so trifling by comparison with those made on the battlefields that it quickly becomes apparent they are hardly sacrifices at all.

The worried old gentleman affectionately known as "Uncle Sam" is, indeed, in need of our wholehearted support . . . genuine patriotism that becomes a device for measuring our true share of sacrifice and brings us ever closer to Victory.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

NON-FERROUS METALS

... News and Market Activities

Norway's Metal Output Disappointing

IN a recent article in *The Economist*, London, it was pointed out that Germany's hopes of turning Norway into an important part of the European war economy have been disappointed. In the early period of Norway's occupation far-reaching plans were made for expanding hydro-electric power stations, and the production of light metals, ferroalloys and chemicals. Construction of power stations for roughly one-quarter of the total prewar generating capacity was to have been completed in stages during 1943 to 1945, but at present not one of these projects has yet been completed. In addition, since the Autumn of 1942 most construction work has had to be suspended because of the shortage of material and labor. An expansion of aluminum capacity from some 37,000 tons to 140,000 tons was envisaged by the Germans, but in 1941 actual output fell to 50 per cent of the 1940 production. In 1942, production may have increased to perhaps 26,000 tons. The lack of imports of bauxite prevented production from being maintained, and construction of new plants for processing Norwegian labradorite met with insurmountable difficulties. Two new companies, the A/S Nordisk Lettmetall of Oslo and the A/S Nordag, were formed to take over all foreign-owned aluminum plants. These companies are controlled by the German I. G. Farben, the Norsk Hydro, the Bank der Deutschen Luftfahrt-Berlin and the Hansa-Leichtmetall AG-Berlin. The Norsk Hydro, which actually expanded its power stations, chemical works and light metal plants, is now completely owned by the I. G. Farben trusts. But the prewar output of iron ore, pyrites, nickel and molybdenum, as well as of ferroalloys, has not been reached.

Copper Order Simplified

• • • For the purpose of simplification, the WPB has made some minor changes in Copper Conservation Order M-9-c, issued Oct. 4.

Control of the use of copper plates in the printing and publishing industry has been transferred to Conservation Order M-339 which is slightly less stringent. Other changes in the orig-

inal order involve only users of unimportant quantities of copper, such as manufacturers of certain lock parts and a few military items and alter very little the quantities permitted.

In the amended order the old list 2-A is incorporated in the general list to make for greater simplicity, but this change does not affect the operation of the order.

Zinc Order Clarified

• • • In response to many inquiries regarding the effects of Conservation Order M-11-b as amended, on zinc uses, the WPB on Oct. 9 issued a statement clarifying several provisions of the amended order.

James Douglas, director of the Zinc Division pointed out that the amended order removes Lend-lease supplies from the list of general exceptions and adds to the list many new items such as coin coatings used by the Treasury, and tokens. As a result of the change processors are now required to include Lend-lease material in their totals when figuring the amount of zinc to which they are entitled under percentage limitations.

New percentage limitations restrict users to 60 per cent of their 1941 consumption on all grades. Under the original order, percentages were based on material put into process, but now the amended version specifies percentages be based on uses. This means that percentages are now reckoned on the basis of end products such as dry cell battery cups, etc., rather than on

the original strip from which they are cut. Allotments may be used at the rate of 15 per cent each quarter. Under the original order plants could put into process 75 per cent of prime Western Grades and 50 per cent on all other grades of 1941 consumption, based on corresponding quarters of the earlier year. Thus, users are now permitted less of one grade and more of others, the result being to equalize overall consumption.

Aluminum Scrap Redefined

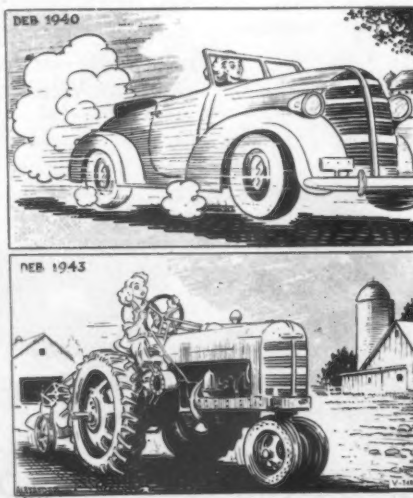
• • • Aluminum residues such as skimmings, drosses, fines, grindings, sawings and buffings containing less than 30 per cent metallic aluminum have been removed from the definition of aluminum scrap by WPB. The definition previously had specified 15 per cent or more. At the same time, relief is afforded from the obligation to segregate aluminum scrap under the segregation program, to persons who do not generate a 1000 lb. or more per month of aluminum scrap in any one plant in any month.

National Bronze Executives Sentenced

Cleveland

• • • Sentences of 10 years each and fines of \$10,000 each were imposed on Frank Edward, and John L. Schmeller, former executives of the National Bronze & Aluminum Co., after having been found guilty of war sabotage by a Federal jury during the past week. Accused of making and selling defective aluminum castings for use in military aircraft, the defendants were tried under the section of the Federal code known as the War Sabotage Act. This was the first time that any American munition manufacturer has been tried and convicted under this act in the current war, and the sentences meted out were the most severe ever imposed on war manufacturers.

The case, which started some months ago over aluminum castings made for Packard Motor Car Co., for use in Rolls-Royce-Merlin engines, accused the three defendants as well as several other plant officials of conspiring to weld defective castings and to conceal the repairs. The defendants were charged on nine counts, but were not convicted on all of them.



NON-FERROUS METALS

Refiner, Smelter Quotations

(Cents per lb.)

Copper, electrolytic, Conn. Valley.....	12.00
Copper, electrolytic, New York.....	11.75
Copper, Lake	12.00
Tin, Straits, New York.....	52.00
Zinc, East St. Louis.....	8.25
Zinc, New York	8.67
Lead, St. Louis	6.35
Lead, New York	6.50
Aluminum, virgin 99+%, delivered.....	15.00
Nickel, electrolytic, base refinery.....	35.00
Magnesium, 99.9+%, carlots	21.50
Magnesium, 12-in. sticks, carlots.....	30.00
Cadmium, delivered	90.00

ALUMINUM, No. 12 foundry grade (No. 2), 13.50c. per lb.; steel deoxidizing grades, 12.50c. to 13.75c. per lb. **ANTIMONY**, Asiatic, New York, nominal; American, 14.50c. a lb., f.o.b. Laredo, Tex., smelter. **MERCURY**, \$191 to \$193 per 76-lb. flask, f.o.b. shipping point or port of entry. **BRASS INGOTS**, commercial 85-5-5-5 (No. 115), 12.25c. a lb. **COBALT**, 97 to 99 per cent, \$2.11 per lb. **BERYLLIUM COPPER**, 3.75 to 4.25 per cent Be, \$15 per lb. contained Be. **GOLD**, U. S. Treasury, \$35 an oz. **INDIUM**, 99.5 per cent, \$10 per troy oz. **IRIDIUM**, \$165 per troy oz. **PALLADIUM**, \$24 per troy oz. **PLATINUM**, \$35 per oz. **SILVER**, open market, New York, 44.75c. per oz. **ARSENIC**, prime, white, 99 per cent, 4c. per lb.

Copper, Copper Base Alloys

(Mill base prices)

Sheet: Copper, 20.87c.; high brass, 19.48c.; low brass, 80 per cent, 20.15c.; red brass, 85 per cent, 20.36c.; commercial bronze, 90 per cent, 21.07c.; 95 per cent, 21.28c.; manganese bronze, 23.00c.; Muntz metal, 22.75c.; naval brass, 24.50c.; phosphor bronze, grades A, B, 5 per cent, 26.25c.; Everdur, Herculey, Olympic or equivalent, 26.00c.; nickel silver, 5 per cent, 26.50c.

Rods: Copper, hot rolled, 17.37c.; drawn, 13.37c.; free cutting brass, 15.01c.; low brass, 80 per cent, 20.40c.; red brass, 85 per cent, 20.61c.; commercial bronze, 90 per cent, 21.32c.; 95 per cent, 21.53c.; Muntz metal, 18.87c.; naval brass, 19.12c.; phosphor bronze, grades A, B, 5 per cent, 26.50c.; Everdur, Herculey, Olympic or equivalent, 25.50c.; nickel silver, 5 per cent, 28.75c.

Extruded Shapes: Copper, 20.87c.; architectural bronze, 19.12c.; manganese bronze, 24.00c.; Muntz metal, 20.12c.; naval brass, 20.37c.

ALUMINUM

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. per lb. (1/2 H); 52S, 61c. (O); 24S, 67 1/2c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c. per lb.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.138 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base price for tubing; 30,000-lb. base price for plate, flat stock. Variations from the above gate, size, temper, finish and quantity require extras.

Extruded Shapes: "As extruded" temper; 2000-lb. base price. 2S and 3S, factor No. 1 to 4, 25.5c. per lb.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28 1/2c.

The factor is determined by dividing perimeter of shape by the weight per lineal foot. All prices above are subject to factor number range, temper, length, dimensional tolerances and quantity extras.

Wire, Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: 1/4 in., 28 1/2c. per lb.; 1/2 in., 26c.; 3/4 in., 24 1/2c.; 1 in., 23c. Hexagonals: 1/4 in., 34 1/2c. per lb.; 1/2 in., 28 1/2c.; 3/4 in., 25 1/2c.; 1 in., 25 1/2c. 2S, as fabricated, random or standard lengths, 1/4 in., 24c. per lb.; 1/2 in., 25c.; 3/4 in., 24c.; 1 in., 23c. 24ST, rectangles and squares, random or standard lengths, 0.093-0.187 in.

thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27 1/2c.

Variation from the above size, temper, finish and quantity require extras.

NON-FERROUS SCRAP METAL QUOTATIONS

Copper, Copper Base Alloy

(Current OPA maximum prices, cents per lb., f.o.b. point of shipment, plus premiums for quantities and special preparation.)

OPA Group 1

No. 1 wire, No. 1 heavy copper..	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper..	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
Lead covered copper wire, cable..	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings..	10.50
Tinny (phosphor bronze) solids..	10.50
Copper-nickel solids and borings..	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Unlined standard red car boxes ..	8.25
Lined standard red car boxes ..	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings ..	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings..	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	8.00
Old rolled brass	7.75
Admiralty condenser tubes	8.00
Muntz metal condenser tubes	7.50
Plated brass sheet, pipe reflectors	7.25 ¹
Manganese bronze solids	6.25 ²
Manganese bronze borings	5.50 ²

OPA Group 4

Automobile radiators	7.00
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OPA Group 5

Refinery brass	5.00*
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*Price varies with analysis. ¹Lead content 0.00 to 0.40 per cent. ²Lead content 0.41 to 1.00 per cent.

MAGNESIUM

Sheet, rod, tubes, bars and extruded shapes are subject to individual quotation. Magnesium Metal Turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c. a lb.

Aluminum

(Current OPA maximum prices, cents per lb., for less than 1000 lb. lots, f.o.b. point of shipment, plus premiums for quantities and special preparation.)

Plant scrap, segregated

2S solids	9.00
All other solids	8.50
Borings and turnings	
Wrought alloys (17S, 18S, 32S, 52S)	7.50
High grade alloys	7.00
Low grade alloys	6.50

Plant scrap, mixed

All solids	7.50
Borings and turnings	5.50

Obsolete scrap

Pure cable	9.00
Old sheet and utensils	7.50
Old castings and forgings	8.00
Pistons, free of struts	8.00
Pistons, with struts	6.00
Old alloy sheet	7.00

For lots of 1000 to 19,999 lb., add 1c. to above prices except for old castings and forgings, pistons free of struts, pistons with struts and old alloy sheet for which there is a premium of 1/2c. a lb. For lots over 19,999 lb. add 1 1/2c. a lb. to prices listed.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

(Current OPA maximum prices, cents per lb., f.o.b., shipping point.)

New zinc clippings, trimmings ..	7.25
Engravers', lithographers' plates..	7.25
Old zinc scrap	5.75
Unsweetened zinc dross	5.30
Die cast slab	5.30
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Soft and hard lead, including cable lead, f.o.b. point of shipment, deduct 0.55c. per lb. from basing point prices for refined metal.

Nickel

Nickel content 98 + per cent, copper under 1/2 per cent, 26c. per lb.; 90 to 98 per cent nickel, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25 1/2
Electrolytic, full size	22 1/2
cut to size	30 1/2
Rolled, oval, straight, 15 in. and longer	23 1/2
Curved	24 1/2
Brass: Cast, 82-20, elliptical, 15 in. and longer	23 1/2
Zinc: Cast, 99.99, 16 in. and over	16 1/2
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	53

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz. lots..	40.32-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc sulphate, 89% crystals, bbls.	6.80

SCRAP

... News and Market Activities

Scrap Drive Needed; Alloys a Problem

... Promise of a shooting war within the next 90 days that will blast away more steel and scrap in that period than has been expended since Pearl Harbor, emphasizes the need of a scrap drive that will build a healthy scrap reserve. The margin of safety for scrap is said to be lower than for any other critical material. Despite these circumstances, public apathy and a shortage of newsprint that is curtailing publicity efforts on the scrap drive bodes ill for any out-

News of Washington on page 104 discusses at length the need for a scrap drive.

standing results tonnage wise. Meanwhile, one estimate of the inflow of battlefield scrap places the total at between 1,000,000 and 1,500,000 tons for the next year.

Conflicting with this estimate is the fact that much finished war equipment is being taken too far away for return as scrap, and captured steelmaking equipment may later swallow great quantities that would otherwise return to this country.

The main problem in electric furnace steel scrap is still the segregation of material. Proper segregation not only saves vital alloys, but facilitated melting practice and permits getting the optimum tonnage from a given furnace. This in turn accelerates steel production, rolling schedules, and serves as a means of getting more steel on the market without increasing furnace capacity. Segregation must start with the plant that generates the scrap and be divided into two phases. 1. Segregation by alloy content, and 2, segregation by the type of scrap.

Bin arrangements and color systems have been tried and proved as an aid to scrap identification. Specific electric furnace scrap grades now in heavy demand are those from SAE steels in the 2300 and 2500 series. As segregation on these has been extremely bad, supplies have practically disappeared. Scrap segregation is an economically sound practice, and in addition can cut the cost of production of electric furnace steel by as much as \$4.00 a ton. As an example of inferior scrap and poor scrap segregation, one company recently kept track of its tool steel scrap purchases. The company claimed that 40 per cent of

the lots received analyzed outside of specifications for tool steel scrap and 10 per cent of these were not even high speed steels.

Alloy steel producers sense a crisis with regard to the types of steels they will produce. Those mills that made binary alloys or steels with only one alloy, such as nickel, are having difficulty in getting scrap that is not ternary alloyed, that is alloyed with chrome, nickel and moly. Consequently, if this is used, the resulting steel will show traces of all three alloys, a condition that is extremely undesirable.

As a result of this scrap situation, there is a trend toward the manufacture of chrome-nickel-moly steels in greater proportions to the binary alloyed steels. This trend is expected to continue to increase as scrap becomes more scarce and more difficult to keep segregated. Also, the binary and single alloyed steel scrap shortage is accentuated by the proportionately greater production of chrome-nickel-moly steels.

Seventy-Five Railroads Meet on Salvage Campaign

New York

... Representatives of more than 75 railroads met here this week with members of the WPB, ODT, Army, Navy and labor heads to discuss their part in the national salvage drive. This meeting, covering WPB regions I, II and III is one of nine to be held in various parts of the country.

Goal set by the meeting was a monthly salvage total for the railroad industry of 300,000 tons per month. Statistics reported showed that in 1942 salvage was raised from 195,000 tons per month to 235,000 tons by October of that year. This year's high was 296,000 tons achieved in April, a total which declined to about 265,000 tons in August. The 300,000 ton goal was believed possible and received a hearty pledge of support from both the railroad and labor men present. The Army and Navy added a strong plea for scrap in addresses given by representatives.

BUFFALO — Scrap operations in the Buffalo district were at an extremely low point this week, virtually all collectors in the area concentrating on collecting old

newspapers in response to an SOS from the local salvage committee. Operators, however, were preparing to go all out in support of the scrap drive next month despite continuing apathy in some quarters. A survey of consumers disclosed that stockpiles were in fair shape and mill buyers are not worried about winter reserves.

CHICAGO — Market is extremely quiet with signs of buyers becoming increasingly finicky as to grades. For instance, it is reported that there is no market locally for turnings. Cast scrap continues to be extremely critical.

BOSTON — Brokers are doing less than a normal business; yards are not looking for more due to the labor situation; interest in the national salvage drive is only lukewarm at best. Because yards are concentrating on small vessels, shipyard scrap accumulations are slower. Importations of battlefield scrap are below expectations. Many metal working shops are changing from one to another line of products, consequently making less scrap.

CINCINNATI — Consumers in this area are showing a definite desire to increase supplies against possible transportation difficulties during the winter. Currently, needs are being supplied, although it is admitted that quality is not of the best. The quantity of production scrap has tended to taper and, so far, results of current civilian scrap drives have not been tabulated.

CLEVELAND — Scrap supplies at the mills in the Cleveland, Youngstown, Warren, and Canton areas are quite critical. Allocations have become necessary to some plants. Electric furnace low phos scrap is, however, accumulating in some areas. The tight spots are in open hearth grades.

The crux of the scrap shortage in this area is believed by some observers to be the manpower shortage in scrap dealers yards.

One relief suggested is for WPB to allocate low phos electric furnace scrap, which is considerably more plentiful, to the open hearths. A premium of about \$2.50 a ton would still be cheaper than bringing scrap in from remote areas where high freight costs must be borne.

PHILADELPHIA — Cast scrap especially in good foundry and steel mill grades is very critical. Low phos has become freer while mills would like better shipments of turnings. No battlefield scrap has reached this district at all. As far as the scrap drive is concerned, no announcement of its existence has been made.

NEW YORK — Conditions here seem to have been stabilized. Cast scrap is not too plentiful while more and more alloy scrap is piling up with no buyers for it. A few barges of battle scrap arrived in this district last week.

PITTSBURGH — Conditions are unchanged here, with consumption of heavy melting and blast furnace grades greater than incoming supplies. Some consumers are still dipping into inventories.

SCRAP PRICES

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES			BLAST FURNACE GRADES			Low Phos.		Heavy Structural and Plate			Foundry Steel			Alloy Free Low Phos. and Sulphur	Heavy Axle and Turn. Electric First Furnace Bundles
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Bk. Shts. No. 1 & 2 Bundles	Unbaked Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punching Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	1 ft. and Under	Auto. Springs, and Crank-shafts	
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton.....	\$20.00	\$15.00	\$15.00	16.00	\$17.00	\$17.50	\$25.00	\$22.50	\$21.50	\$22.00	\$22.50	\$21.50	\$22.00	\$21.00	\$18.00	\$19.50
Cleveland, Middletown, Cincinnati, Portsmouth.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point..	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25
Ashland, Ky.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00
Buffalo, N. Y.....	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75
Bethlehem, Pa.; Kokomo, Ind..	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75
Duluth, Minn.....	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50
Detroit, Mich.....	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35
Toledo, Ohio.....	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00
St. Louis, Mo.....	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburgh, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50
Minneapolis, Colo.....	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00
Seattle, Wash.....	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00

*Baled turnings are \$5 per gross ton higher.

BUNDLES: Tin can bundles are \$4 below dealers' No. 2 bundles. No. 3 bundles are \$2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is \$15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Minimum set at \$14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is \$15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of \$6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburgh, Cal., 42c.; Middletown, 14c.; Sparrows Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minneapolis, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakmont, Cal. Claymont, Del., includes the switching point of Chester, Pa. Chicago includes Gary, Ind., switching district.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above

for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be \$3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made \$4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge \$2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced—\$2; 75 to 85% Fe—\$4; under 75% Fe—\$8 per ton. Mill scale of 65% or more Fe—\$8 per ton. Mill cinder and grindings, shipping point maximum price of \$4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), \$1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), \$2 less than No. 1 heavy melting. If loaded in box cars add 75c.

*At Memphis 50c.; Great Lakes ports \$1; New England \$1.25.

RAILROAD SCRAP

	Scrap Rails			Scrap Rails		
	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	3 ft. and Under	2 ft. and Under	18 in. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown.....	\$20.50	\$21.50	\$23.00	\$23.50	\$23.75	\$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown.....	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington..	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco.....	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo.....	20.25	21.25	22.75	23.25	23.50	23.75
Detroit.....	18.85	19.85	21.35	21.85	22.10	22.35
Duluth.....	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.....	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.....	19.25	20.25	21.75	22.25	22.50	22.75
Seattle.....	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis.....	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast.....	\$18.00	\$19.00	\$20.00
Clean auto cast.....	18.00	19.00	20.00
Unstripped motor blocks.....	15.50	16.50	17.50
Stove Plate.....	17.00	18.00	19.00
Heavy Breakable Cast.....	15.50	16.50	17.50
Charging Box Size Cast.....	17.00	18.00	19.00
Misc. Malleable.....	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C: States not named in A and B; switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

BASE PRICE SEGREGATED

	Solids, Lb. Cont. W	Turnings, Lb. Cont. W
Type 1.....	\$1.80	\$1.60
Type 2.....	1.60	1.40
Type 3.....	1.25	1.25
Type 4*.....	0.125	0.105
Type 5*.....	0.135	0.115

*Per lb. of scrap material.

BASE PRICE UNSEGREGATED, SOLIDS

\$1.50 per lb. contained W if 5% or more.
\$1.15 per lb. contained W if over 1% and less than 5%.
\$0.80 per lb. contained Mo if 1½% or more.

BASE PRICE UNSEGREGATED TURNINGS

\$1.30 per lb. contained W if 5% or more.
\$1.00 per lb. contained W if 1% and less than 5%.
\$0.70 per lb. contained Mo if 1½% or more.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*.

[Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Hot rolled sheets.....	2.10	2.10	2.10	2.10
Cold rolled sheets.....	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip.....	2.10	2.10	2.10	2.10
Cold rolled strip.....	2.80	2.80	2.80	2.80
Plates.....	2.10	2.10	2.10	2.10
Plates, wrought iron.....	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00

Tin and Terne Plate: (Dollars Per Base Box)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Tin plate, standard cokes	\$5.00	\$5.00	\$5.00	\$5.00
Tin plate, electrolytic...	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30

Bars and Shapes: (Cents Per Lb.)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Merchant bars.....	2.15	2.15	2.15	2.15
Cold finished bars.....	2.65	2.65	2.65	2.65
Alloy bars.....	2.70	2.70	2.70	2.70
Structural shapes.....	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars.....	4.40	4.40	4.40	4.40

Wire and Wire Products: (Cents Per Lb.)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Plain wire.....	2.60	2.60	2.60	2.60
Wire nails.....	2.55	2.55	2.55	2.55

Rails: (Dollars Per Gross Ton)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Heavy rails.....	\$40.00	\$40.00	\$40.00	\$40.00
Light rails.....	40.00	40.00	40.00	40.00

Semi-Finished Steel: (Dollars Per Gross Ton)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Rerolling billets.....	\$34.00	\$34.00	\$34.00	\$34.00
Sheet bars.....	34.00	34.00	34.00	34.00
Slabs.....	34.00	34.00	34.00	34.00
Forging billets.....	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00

Wire Rods and Skelp: (Cents Per Lb.)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Wire rods.....	2.00	2.00	2.00	2.00
Skelp (grvd).....	1.90	1.90	1.90	1.90

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 187-199.

Composite Prices . . .

FINISHED STEEL	
Oct. 12, 1943.....	2.25513c. a Lb.....
One week ago.....	2.25513c. a Lb.....
One month ago.....	2.25513c. a Lb.....
One year ago.....	2.26190c. a Lb.....

	HIGH	LOW
1943.....	2.25513c.,	2.25513c.,
1942.....	2.26190c.,	2.26190c.,
1941.....	2.43078c.,	2.43078c.,
1940.....	2.30467c., Jan. 2	2.24107c., Apr. 16
1939.....	2.35367c., Jan. 3	2.26689c., May 16
1938.....	2.58414c., Jan. 4	2.27207c., Oct. 18
1937.....	2.58414c., Mar. 9	2.32263c., Jan. 4
1936.....	2.32263c., Dec. 28	2.05200c., Mar. 10
1935.....	2.07642c., Oct. 1	2.06492c., Jan. 8
1934.....	2.15367c., Apr. 24	1.95757c., Jan. 2
1933.....	1.95578c., Oct. 3	1.75836c., May 2
1932.....	1.89196c., July 5	1.83901c., Mar. 1
1931.....	1.99626c., Jan. 13	1.86586c., Dec. 29
1930.....	2.25488c., Jan. 7	1.97319c., Dec. 9
1929.....	2.31773c., May 28	2.26498c., Oct. 29

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

PIG IRON	
.....23.61 a Gross Ton.....	
.....23.61 a Gross Ton.....	
.....23.61 a Gross Ton.....	
.....23.61 a Gross Ton.....	

	HIGH	LOW
.....	\$23.61	\$23.61
.....	23.61	23.61
\$23.61, Mar. 20	\$23.45, Jan. 2	
23.45, Dec. 23	22.61, Jan. 2	
22.61, Sept. 19	20.61, Sept. 12	
23.25, June 21	19.61, July 6	
23.25, Mar. 9	20.25, Feb. 16	
19.74, Nov. 24	18.73, Aug. 11	
18.84, Nov. 5	17.83, May 14	
17.90, May 1	16.90, Jan. 27	
16.90, Dec. 5	13.56, Jan. 3	
14.81, Jan. 5	13.56, Dec. 6	
15.90, Jan. 6	14.79, Dec. 15	
18.21, Jan. 7	15.90, Dec. 16	
18.71, May 14	18.21, Dec. 17	

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Pig Iron: (Per Gross Ton)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
No. 2 fdy., Philadelphia...	\$25.84	\$25.84	\$25.89	\$25.89
No. 2, Valley furnace....	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti...	24.68	24.68	24.68	24.68
No. 2, Birmingham.....	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa...	25.39	25.39	25.39	25.39
Basic, Valley furnace....	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley.....	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago...	31.34	31.34	31.34	31.34
Ferromanganese†	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Heavy melt'g steel, P'gh.	\$20.00	\$20.00	\$20.00	\$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh...	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia.	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go.....	20.00	20.00	20.00	20.00

Coke, Connellsville: (Per Net Ton at Oven)	Oct. 12, 1943	Oct. 5, 1943	Sept. 14, 1943	Oct. 13, 1942
Furnace coke, prompt...	\$6.50	\$6.50	\$6.50	\$6.00
Foundry coke, prompt...	7.50	7.375	6.875	6.875

Non-Ferrous Metals: (Cents per Lb. to Large Buyers)	
Copper, electro., Conn...	12.00
Copper, Lake, New York.	12.00
Tin (Straits), New York.	52.00
Zinc, East St. Louis....	8.25
Lead, St. Louis.....	6.35
Aluminum, Virgin, del'd..	15.00
Nickel, electrolytic.....	35.00
Magnesium, ingot.....	20.50
Antimony (Asiatic), N. Y.	16.50

SCRAP STEEL	
.....\$19.17 a Gross Ton.....	
.....\$19.17 a Gross Ton.....	
.....\$19.17 a Gross Ton.....	
.....\$19.17 a Gross Ton.....	

	HIGH	LOW
.....	\$19.17	\$19.17
.....	19.17	19.17
\$22.00, Jan. 7	\$19.17, Apr. 10	
21.83, Dec. 30	16.04, Apr. 9	
22.50, Oct. 3	14.08, May 16	
15.00, Nov. 22	11.00, June 9	
21.92, Mar. 30	12.67, June 9	
17.75, Dec. 21	12.67, June 9	
13.42, Dec. 10	10.33, Apr. 29	
13.00, Mar. 13	9.50, Sept. 25	
12.25, Aug. 8	6.75, Jan. 3	
8.50, Jan. 12	6.43, July 5	
11.33, Jan. 6	8.50, Dec. 29	
15.00, Feb. 18	11.25, Dec. 9	
17.58, Jan. 29	14.08, Dec. 3	

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, mutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates.

Basing Point ↓ Product													10 DELIVERED TO		
	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Young- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	Detroit	New York	Phila- delphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled ¹	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes ²	3.80¢		3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled ³	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled ⁴	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester = 3.00¢)				2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢		(Worcester = 3.35¢)				3.05¢	3.31¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	\$5.00	\$5.00	\$5.00						\$5.10					5.36¢	5.32¢
.50 } Electro tin plate, box	\$4.50	\$4.50	\$4.50												
.75 }	\$4.65		\$4.65												
Black plate, 29 gage ⁵	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ ¹³			3.37¢
Mfg. ternes, special box	\$4.30	\$4.30	\$4.30						\$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth = 2.25¢)		2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel ⁶	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢ ¹³	2.25¢	2.39¢	
Reinforcing (rail) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢ ¹³	2.25¢		2.47¢
Cold finished ⁸	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)					2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton = 2.70¢)				2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES									(Coatesville and Claymont = 2.10¢)						
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.45¢	2.65¢	2.31¢	2.29¢	2.15¢
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢				(Coatesville = 3.50¢)					3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem = 2.10¢)		2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢					(Worcester = 3.00¢)						
0.51 to 0.75 Carbon	4.30¢			4.30¢					(Worcester = 4.50¢)						
0.76 to 1.00 Carbon	6.15¢			6.15¢					(Worcester = 6.35¢)						
1.01 to 1.25 Carbon	8.35¢			8.35¢					(Worcester = 8.55¢)						
WIRE ⁹															
Bright ¹⁰	2.60¢	2.60¢		2.60¢	2.60¢				(Worcester = 2.70¢)			3.10¢			2.92¢
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢					(Worcester = 3.30¢)			3.70¢			3.52¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

¹ Mill run sheets are 10c per 100 lb. less than base; and primes only, 25c. above base. ² Unassorted 8-lb. coating. ³ Widths up to 12 in. ⁴ Carbon 0.25 per cent and less. ⁵ Applies to certain width and length limitations. ⁶ For merchant trade. ⁷ Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. ⁸ Also shafting. For quantities of 20,000 to 29,999 lb. ⁹ Carload lot to manufacturing trade. ¹⁰ These prices do not apply if the customary means of transportation (rail and water) are not used. ¹¹ Boxed. ¹² Portland and Seattle price, San Francisco price is 2.50c. ¹³ This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILING—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote 2.35c. at established basing points, Calumet Steel division of Borg Warner may quote 2.35c., Chicago, on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote for shipment to Detroit area on Middletown base; Parkersburg Iron & Steel may quote \$2.25 per hundred f.o.b. Parkersburg, W. Va. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points; Parkersburg Iron & Steel may quote \$3.85 per hundred f.o.b. Parkersburg, W. Va. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote 2.30c. established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. **SEMIFINISHED STEEL**—Follansbee Steel Corp. may sell forging billets at \$40.50 f.o.b. Toronto; Continental Steel Corp. may sell Acme Steel Co. at \$34 for rerolling billets plus extras and freight; Ford Motor Co. may sell rerolling billets at \$34 f.o.b. Dearborn; Andrews Steel Co. may sell forging billets at \$50 at established basing points and slabs at \$41; Empire Sheet and Tin Plate may sell slabs at \$41 at established basing points and sheet bars at \$39 f.o.b. mill; on lend-lease sales Northwestern Steel & Wire Co. may charge \$41 per gross ton f.o.b. mill for rerolling billets; on lend-lease sales Wheeling Steel Corp. may charge \$36 per ton for small billets, f.o.b. Portsmouth and \$37 per ton for sheet bars f.o.b. Portsmouth; Laclede Steel Co. on semi-finished sales for lend-lease shipped to eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. **ALLOY STEEL BARS**—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

PRICES

WAREHOUSE PRICES

(Delivered Metropolitan areas, per 100 lb. These prices do not necessarily apply for dislocated tonnage shipments when the f.o.b. City prices are used in conformance with OPA Schedule 49)

Cities	SHEETS			STRIP		Plates 1/4 in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	†† Hot Rolled, 2300	† Hot Rolled, 3100	†† Cold Drawn, 2300	† Cold Drawn, 3100
*Philadelphia	\$3.518	\$4.872 ^s	\$5.018	\$3.922	\$4.772	\$3.605	\$3.666	\$3.822	\$4.072		\$7.118		
*New York	3.590	4.613 ²	5.010	3.974 ^a	4.774	3.768	3.758	3.853	4.103	6.008	7.158	7.303	8.453
*Boston	3.774	4.744	5.224	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.312	7.344	8.494
*Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052				
*Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165				
*Washington	3.596	4.841	5.196	4.041	4.741	3.796	3.930	3.941	4.041				
*Chicago	3.25	4.20	5.23 ⁴	3.60	4.65 ⁵	3.55	3.55	3.50	3.75	5.75	6.90	6.85	8.00
*Milwaukee	3.387	4.337 ²	5.272 ⁴	3.737	4.787 ⁵	3.687	3.687	3.637	3.887	5.987	7.137	7.087	8.237
*Cleveland	3.35	4.40	4.877 ⁴	3.60	4.45	3.40	3.588	3.35	3.75	5.958	7.108	6.85	8.00
*Buffalo	3.35	4.40	4.75 ⁴	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.90	6.85	8.00
*Detroit	3.45	4.50	5.00 ⁴	3.70	5.908 ⁵	3.609	3.661	3.45	3.80	6.08	7.23	7.159	8.309
*Cincinnati	3.425	4.475 ²	4.825 ¹	3.675	4.711	3.611	3.691	3.611	4.011				
*St. Louis	3.397	4.247 ²	5.172 ⁴	3.747	4.931 ⁵	3.697	3.697	3.647	4.031	6.131	7.281	7.231	8.381
*Pittsburgh	2.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	7.15	6.85	8.25
*St. Paul	3.51	4.46	5.257 ⁴	3.86	4.35 ⁵	3.81 ¹	3.81 ¹	3.76 ⁹	4.361	6.09	7.24	7.561	8.711
*Omaha	3.865	5.443	5.608 ⁴	4.215		4.165	4.165	4.115	4.443				
*Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.23	7.18	8.33
*Birmingham	3.45 ³		4.75 ¹	3.70 ³		3.55 ³	3.55 ³	3.50 ³	4.43				
*Memphis	3.85	4.66	5.25	4.10		3.95	3.95	3.90	4.31				
*New Orleans	3.95	4.95	5.25	4.20		3.90	3.90	4.10	4.60				
*Houston	3.75	5.43	5.25	4.30		5.25	5.25	3.75	4.50				
*Los Angeles	4.95	7.15	5.95	4.90		4.90	4.60	4.35	5.70	9.55	8.55	10.55	9.55
*San Francisco	4.55	7.55	6.60	4.50		4.65	4.35	3.95	5.55	9.80	8.80	10.80	9.80
*Seattle	4.65 ⁷	6.63	5.70 ⁷	4.25		4.75	4.45	4.20	5.75		8.00		

NATIONAL EMERGENCY (N. E.) STEELS (Hot Rolled Mill Extras for Alloy Content)

Designa- tion	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Man- ganese	Phos- phorus Max.	Sulph- ur Max.	Silicon	Chro- mium	Nickel	Molyb- denum	Bars and Strip	Billets, Blooms and Slabs	Bars and Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	\$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40	8.00		
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25			.65	13.00		
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	\$25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537 ^a	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540 ^a	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542 ^a	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545 ^a	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550 ^a	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over: Ex- ceptions: ¹ 500 to 1499 lb. ² 400 to 1499 lb. ³ 400 to 3999 lb. ⁴ 450 to 1499 lb. ⁵ 1000 to 1999 lb. ⁶ 100 to 1999 lb. ⁷ 300 to 10,000 lb. ⁸ 2000 to 39,999 lb. ⁹ 400 to 14,999 lb. At Philadelphia galvanized sheets, 2500 more bundles; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; San Francisco, hot rolled sheets, 400 to 39,999 lb.; galvanized and cold rolled sheets, 750 to 4999 lb.; cold fin. bars, 0-299 lb.; hot rolled alloy bars, 0-4999 lb.; Seattle, cold finished bars, 1000 lb. and over, hot rolled alloy bars, 0-1999 lb.; Memphis, hot rolled sheets, 400 to 1999 lb., galvanized sheets, 150 and over; Los Angeles, hot rolled sheets, bars, plates, cold rolled sheets, 300 to 1999 lb.; galvanized sheets, 1 to 6 bundles; cold finished bars, 1 to 99 lb.; SAE bars, 100 lb. Extras for size, quality, etc., apply on above quotations.

† Los Angeles, San Francisco and Seattle prices reflect special provisions of amendment No. 2 to OPA Price Schedule No. 49.

†† For zoned cities these grades have been revised to NE 8617-20.

‡ For zoned cities these grades have been revised to NE 9442-45 Ann'd.

* Base delivered prices according to prior zones established by Amendments to RPS 49 including the 3% transportation tax—not in- cluding the 6% freight increase of March 11, 1942, rescinded May 15, 1943.

*Recommended for large sections only. Note: The extras shown above are in addition to a base price of 2.70c. per 100 lb., on finished products and \$54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, \$5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

PRICES

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago....	\$54.80
6-in. and larger, del'd New York....	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle. 71.20	
Class "A" and gas pipe, \$3 extra; 4-in. pipe is \$3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is \$45 at Birmingham and \$53.80 delivered Chicago, \$59.40 at San Francisco and Los Angeles, and \$70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.	

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports*)

	Per Gross Ton
Old range, bessemer, 51.50	\$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

COKE

Furnace

	Per Net Ton
†Connellsville, prompt	\$6.50*

Foundry

†Connellsville, prompt	7.50
Fayette County, W. Va. (Beehive) ..	8.10
By-product, Chicago	12.25
By-product, New England	13.75
By-product, Newark 12.40 to	12.95
By-product, Philadelphia	12.38
By-product, Cleveland	12.30
By-product, Cincinnati	11.75
By-product, Birmingham	8.50†
By-product, St. Louis	12.02
By-product, Buffalo	12.50

Maximum by-product coke prices established by OPA became effective Oct. 1, 1941.

*Hand-drawn ovens using trucked coal are permitted to charge \$7.00 per net ton, plus usual transportation. Maximum beehive furnace coke prices established by OPA, Feb. 8, 1942. †F.o.b. oven.

FLUORSPAR

Maximum price f.o.b. consumer's plant, \$30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

	Base price per short ton
Effective CaF ₂ Content:	
70% or more	\$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

REFRACTORIES

(F.o.b. Works)

	Per 1000
Fire Clay Brick	
Super-duty brick, St. Louis	\$64.60
First quality, Pa., Md., Ky., Mo., Ill. 51.30	
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill. 46.55	
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham ...	\$51.30
Chicago District	58.90
Silica cement, net ton (Eastern) ..	9.00

Chrome Brick

	Per Net Ton
Standard, chemically bonded, Balt., Plymouth Meeting, Chester	\$54.00

Magnesite Brick

Standard, Balt. and Chester	\$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	\$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	32.00

Atlas

COOLANT PUMPS



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TOOLS
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\$23⁷⁵
and up

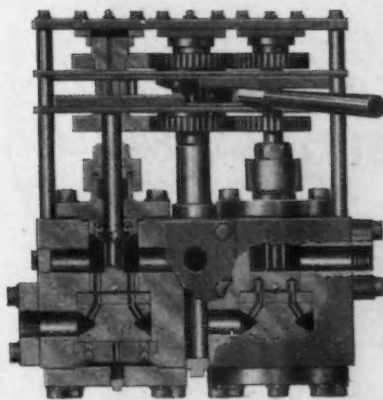
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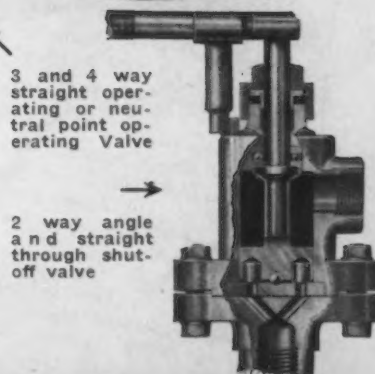
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*No Shock on Line
When Closing*

**HYDRA
VENTURI-VACUUM
VALVES**

A turn of the wrist operates the Hydra Venturi-Vacuum Valve and no matter how high the pressure there is no shock on the line when closing. Other important features, — no springs or cups to bother with, reduced maintenance cost, long life. Many installations in the Steel, Rubber, Packing, Car Building, and Foundry industries support these claims. Write for descriptive folder.



ALBRIGHT EQUIPMENT CO.

FERNDAL, JOHNSTOWN, PA.

CONCO

3-Motor Single Girder
CAB OR FLOOR
OPERATED

ELECTRIC CRANE . . .



Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities: 250 lb.—\$139.50, 500 lb.—\$149.50, 1000 lb.—\$159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.



CONCO ENGINEERING WORKS

Div. of H. D. Conkey & Co. — 15 Grove St. — Mendota, Ill.

Builders Of Conco Torpedo Electric Hoist

How else could you do this job economically?

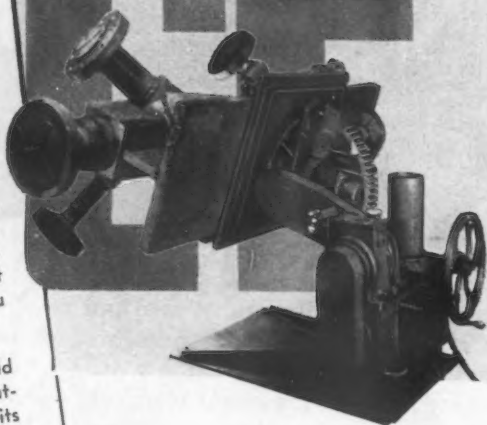
To weld all seams and joints of this complex weldment down hand, the weldment had to be tilted, rotated, twisted, and turned—had to be held in a score of different positions. This is easily done with a C-F Positioner, for at the push of a button it will rotate a weldment (thru 360°) or tilt it (thru 135° beyond horizontal).

Without a Positioner it would require almost constant attendance of a crane and its sling crew, with horses and plenty of floor clearance for handling.

C-F Welding Positioners come in sizes and capacities up to 30,000 lbs. All are pedestal mounted and are adjustable for height.

Write for Bulletin WP-22.

Welding POSITIONERS



CULLEN-FRIESTEDT Co.

1303 S. Kilbourn Ave.

CHICAGO 23, U.S.A.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent Off List
1/2 in. & smaller x 6 in. & shorter	65 1/2
9/16 & 5/8 in. x 6 in. & shorter	63 1/2
3/4 to 1 in. x 6 in. & shorter	61
1 1/4 in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed: (Hexagon or Square)

1/2 in. and smaller	62
9/16 to 1 in. inclusive	59
1 1/4 to 1 1/2 in. inclusive	57
1 5/8 in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	62	64
1/2 in. and smaller	62	64
3/4 in. through 1 in.	59	60
9/16 to 1 in.	59	60
1 1/4 in. through 1 1/2 in.	57	58
1 5/8 in. and larger	56	57

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets (1/2 in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	\$3.75

Small Rivets (7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb.	
No. 1 O.H., gross ton	\$40.00
Angle bars, 100 lb.	2.70
(F.o.b. Basing Points)	Per Gross Ton
Light rails (from billets)	\$40.00
Light rails (from rail steel)	\$39.00
	Base per lb.
Cut spikes	3.00c
Screw spikes	5.15c
Tie plates, steel	2.15c
Tie plates, Pacific Coast	2.30c
Track bolts	4.75c
Track bolts, heat treated, to railroads	5.00c
Track bolts, jobbers discount	63-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	\$6.00	\$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PRICES

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	\$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	\$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe) Base Price—\$200 per Net Ton

Steel (Butt Weld)

	Black	Galv.
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½

Wrought Iron (Butt Weld)

½ in.	25	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Steel (Lap Weld)

2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½

Wrought Iron (Lap Weld)

2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17

Steel (Butt, extra strong, plain ends)

	Black	Galv.
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57

Wrought Iron (Same as Above)

½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Steel (Lap, extra strong, plain ends)

2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56

Wrought Iron (Same as Above)

2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card. F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher on all butt weld.

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There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.

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PRICES

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos- phorus	Charcoal
Boston††	\$25.50	\$25.00	\$26.50	\$25.50		
Brooklyn	27.50			28.00		
Jersey City	26.53	26.03	27.53	27.03		
Philadelphia	25.84	25.34	26.84	26.34	\$30.74	
Bethlehem, Pa.	25.00	24.50	26.00	25.50		
Everett, Mass.††	25.00	24.50	26.00	25.50		
Swedeland, Pa.	25.00	24.50	26.00	25.50		
Steelton, Pa.		24.50				
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	
Sparrows Point, Md.	25.00	24.50			29.50	
Erie, Pa.	24.00	23.50	25.00	24.50		
Neville Island, Pa.	24.00	23.50	24.50	24.00		
Sharpville, Pa.*	24.00	23.50	24.50	24.00		
Buffalo	24.00	23.00	25.00	24.50	29.50	
Cincinnati, Ohio	23.94	23.94		25.11		
Canton, Ohio	25.39	24.89	25.89	25.39	32.69	
Mansfield, Ohio	25.94	25.44	26.44	25.94	32.86	
St. Louis	24.50	24.50				
Chicago	24.00	23.50	24.50	24.00	35.46	\$31.34
Granite City, Ill.	24.00	23.50	24.50	24.00		
Cleveland	24.00	23.50	24.50	24.00	32.42	
Hamilton, Ohio	24.00	23.50		24.00		
Toledo	24.00	23.50	24.50	24.00		
Youngstown*	24.00	23.50	24.50	24.00	32.42	
Detroit	24.00	23.50	24.50	24.00		
Lake Superior fc.					\$34.00	
Lyles, Tenn. fc.†					33.00	
St. Paul	26.76		27.26	26.76	39.80	
Duluth	24.50	24.00	25.00	24.50		
Birmingham	20.38	19.00	25.00			
Los Angeles	26.95					
San Francisco	26.95					
Seattle	26.95					
Provo, Utah	22.00	21.50				
Montreal	27.50	27.50		28.00		
Toronto	25.50	25.50		26.00		

GRAY FORGE IRON: Valley or Pittsburgh furnace\$23.50

*Pittsburgh Coke & Iron Co. (Sharpeville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

**Pittsburgh Ferromanganese Co. (Chester furnace only) may charge \$2.25 a ton over maximum basing point prices.

†Price shown is for low-phosphorous iron; high-phosphorous sells for \$28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at \$2 per gross ton above maximum prices.

Delta Chemical & Iron Co., Chicago, may charge \$30 for charcoal iron at its Delta, Mich., furnace.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, \$2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and \$1 per ton extra for each additional 0.25 per cent nickel.

Metal Powders

Prices are based on current market prices of ingots plus a fixed figure. For ton lots f.o.b. shipping point, in cents per lb.

Copper, electrolytic, 150 and 200 mesh	21½ to 23¼c.
Copper, reduced, 150 and 200 mesh	20½ to 25¼c.
Iron, commercial, 100 and 200 mesh	13½ to 15c.
Iron, crushed, 200 mesh and finer.	4c.
Iron, hydrogen reduced, 300 mesh and finer	63c.
Iron, electrolytic, unannealed, coarser than 300 mesh	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh	42c.
Iron, carbonyl, 300 mesh and finer	90c.
Aluminum, 100 and 200 mesh.	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	\$1
Chromium, 150 mesh	\$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12¼c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¼c.

*Freight allowed east of Mississippi.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless	Lap Weld
	Cold Drawn	Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04
2½ in. o.d. 12 B.W.G.	20.21	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50
3½ in. o.d. 11 B.W.G.	28.37	24.62
4 in. o.d. 10 B.W.G.	35.20	30.54
(Extras for less carload quantities)		
40,000 lb. or ft., and over	Base	
30,000 lb. or ft.	to 39,999 lb. or ft.	5%
20,000 lb. or ft.	to 29,999 lb. or ft.	10%
10,000 lb. or ft.	to 19,999 lb. or ft.	20%
5,000 lb. or ft.	to 9,999 lb. or ft.	30%
2,000 lb. or ft.	to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.		65%



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PRICES

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are \$2.00 higher; f.o.b. Duluth, billets only, \$2.00 higher; billets f.o.b. Pacific ports are \$12 higher. Delivered prices do not reflect new three per cent tax on freight rates.

	Per Gross Ton
Rerolling	\$34.00
Forging quality	40.00
Alloy steel: Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton	\$54.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	\$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00
Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham. Prices delivered Detroit are \$2.00 higher.	

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	\$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

	(No. 5 to 9/32 in.)	Per Lb.
Pittsburgh, Chicago, Cleveland		2.00c.
Worcester, Mass.		2.10c.
Birmingham		2.00c.
San Francisco		2.50c.
Galveston		2.35c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57 1/2c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 2c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	13.00c.
Sheets	19.00c.

*Includes annealing and pickling.

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New and inexperienced operators readily acquire skill and speed on the Krane Kar . . . thanks to the always-in-gear design and automatic braking in all crane operations, and the self-stabilizing feature for safety when handling loads at the sides. Write for literature.

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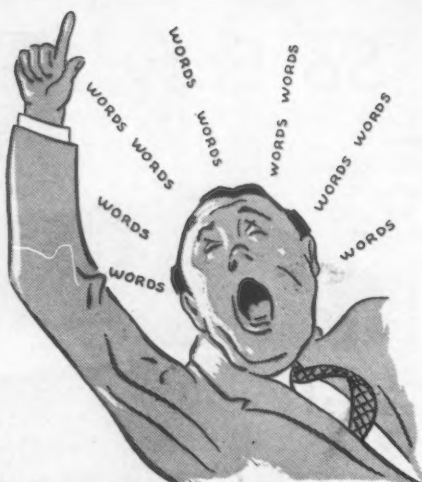
Usually too many, we think. We're not very long on words here at Dunbar's. Springmaking is our business and we prefer to stick to it. We'd rather show you how your spring may be improved, perhaps at lower cost—or possibly at savings in assembly time. We like to work on new spring developments, too. It's sort of a hobby with us.

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PRICES

Ferromanganese

78-82% manganese, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn. Carload lots (bulk) \$135.00
Ton lots (packed) 141.00
Less ton lots (packed) 148.50
Premium, \$1.70 for each 1% above 82% Mn; penalty, \$1.70 for each 1% below 78%.

Electrolytic Manganese

99.9% manganese, maximum base contract price per lb. of metal, bulk, f.o.b. shipping point, with freight allowed to destination. Size, 1" x D.

	Eastern Zone	Central Zone	Western Zone
Carload lots	37.60c.	37.85c.	38.15c.
l.c.l. lots	39.60c.	38.60c.	40.65c.

Spiegeleisen

Maximum base contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn	19-21% Mn	26-28% Mn
1% max. Si	1% max. Si	1% max. Si	1% max. Si
Carloads	\$35.00	\$36.00	\$49.50
Less ton*	47.50	48.50	62.00

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% silicon ...	6.65c.	7.10c.	7.25c.
75% silicon ...	8.05c.	8.20c.	8.75c.

Spot sales 45c. per lb. higher for 50% Si; 30c. for 75% Si. For extras and premiums see MPR 405.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)
F.o.b. Jackson, Ohio \$29.50*
Buffalo 30.75*

For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add \$1 a ton for 0.75% phosphorus or over.

*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are \$1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% silicon.

	Eastern Zone	Central Zone	Western Zone
Car lots ...	3.36c.	3.50c.	3.65c.

Spot prices 1/4c. higher per lb. of briquet. For premiums and extras see MPR 405.

Silicomanganese

(Per gross ton, delivered, carloads, bulk)

3.00 carbon	\$120.00*
2.50 carbon	125.00*
2.00 carbon	130.00*
1.00 carbon	140.00*

Briquets, contract, basis carlots, bulk freight allowed, per lb. ... 5.80c.
Packed 6.05c.
Less ton lots 6.55c.

*Spot prices are \$5 per ton higher.

†Spot prices 1/4c. higher.

Ferrocchrome

(65-72% Cr, 2% max. Si)
OPA maximum base contract prices per lb. of contained Cr, lump size in carlots, f.o.b. shipping point, freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
0.03% carbon ..	25.00c.	25.40c.	26.00c.
0.06% carbon ..	23.00c.	23.40c.	24.00c.
0.10% carbon ..	22.50c.	22.90c.	23.50c.
1.00% carbon ..	20.50c.	20.90c.	21.50c.
2.00% carbon ..	19.50c.	19.90c.	20.50c.

Spot prices are 1/4c. higher per lb. contained Cr. For extras and premiums see MPR 407.

PRICES

(Other Ferroalloys)

Ferrotungsten, delivered, carlots, per lb. contained tungsten	\$1.90
Tungsten metal powder, 98%-99%, any quantity, per lb.	\$2.60
Ferrovandium, 35%-40%, contract basis, f.o.b. producers plant, usual freight allowances, open-hearth grade, per lb. contained vanadium	\$2.70
Special grade	\$2.80
Very special grade	\$2.90
Vanadium pentoxide, 88%-92% V ₂ O ₅ technical grade, contract basis, any quantity, per lb. contained V ₂ O ₅	\$1.10
Ferroboron, contract basis, 17.50% boron minimum, f.o.b. Niagara Falls, carlots, per lb. alloy	\$1.20
Ton lots	\$1.25
Silicaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	23c.
Silicaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	40c.
Crucial, f.o.b. Bridgeville, Pa., freight allowed 100 lb. and over, maximum based on rate to St. Louis, per lb.	45c.
Bortan, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Borosil, 3% to 4% boron, 40 to 45% silicon, f.o.b. Philo, Ohio, per lb. contained boron	\$7.00
Ferrocolumbium, 50% to 60%, f.o.b. Niagara Falls, ton lots, per lb. contained columbium ...	\$2.25
Less ton lots	\$2.30
Ferrotitanium, 40%-45%, f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained titanium	\$1.23
Less ton lots	\$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	\$1.35
Less ton lots	\$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per gross ton....	\$142.50
3%-5% carbon	\$157.50
Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with \$3 unitage freight equalled with Rockdale, Tenn., per gross ton	\$58.50
Ferrophosphorus, electrolytic 23-25%, carlots, f.o.b. Monsanto (Siglo), Tenn., \$3 unitage freight equalled with Nashville, per gross ton	\$75.00
Ferromolybdenum, 55-75 per cent, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum	95c.
Calcium molybdate, 40%-45%, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum...	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo.	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo.	80c.
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb. Under 100 lb.	\$2.60 \$3.00
Ironium, 35-40%, contract basis, carloads in bulk or package, per lb. of alloy	15c.
Less ton lots	16c.
Ironium, 12-15%, contract basis, carlots, bulk, per gross ton....	\$102.50
Packed	\$107.50
Less ton lots	\$112.50
Alifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, per lb. ...	7.50c.
Ton lots	8c.
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NOTE!
See the U.S.P. Display Room 764 Palmer House at the National Metal Congress Oct. 18-22



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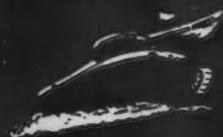
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